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Foster

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(54) **SHOTGUN AMMUNITION CONVERSION SYSTEM**

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(51) **Int. Cl.**

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F41A 9/55	(2006.01)
F41A 9/72	(2006.01)
F41C 7/02	(2006.01)

(52) **U.S. Cl.**

CPC ... ***F41A 9/55*** (2013.01); ***F41A 9/72*** (2013.01); ***F41C 7/02*** (2013.01); *F41A 9/65* (2013.01); *Y10T 29/49947* (2015.01)

(58) **Field of Classification Search**

CPC F41A 11/02; F41A 99/00; F41A 9/71; F41A 9/55; F41A 9/65; F41A 9/72; F41C 7/02

USPC 42/69.01, 49.02, 49.01, 19, 6, 17, 50, 42/18; 89/197, 33.04, 33.1

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,864,758	A *	9/1989	Crossman	42/18
5,056,252	A *	10/1991	Velezis	42/50
6,032,395	A *	3/2000	Bentley et al.	42/19
6,912,806	B2 *	7/2005	Malindretos	42/17
8,418,390	B1 *	4/2013	Wright	42/49.01
8,667,723	B2 *	3/2014	Bentley et al.	42/49.01
8,756,846	B1 *	6/2014	Lemoine	42/69.01
2006/0048426	A1 *	3/2006	Crandall	42/69.01

* cited by examiner

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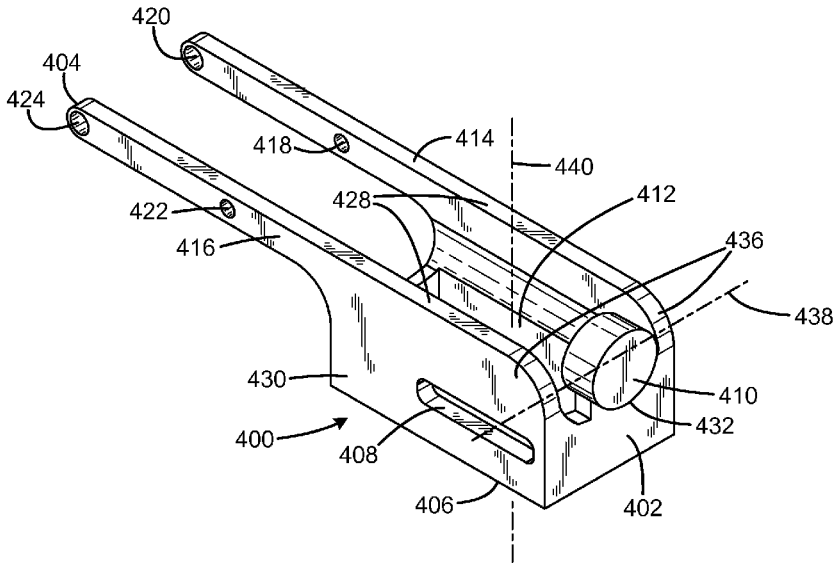
(57) **ABSTRACT**

A shotgun ammunition conversion system has a detachable magazine well having a sleeve defining a rectangular passage adapted to removably receive an ammunition magazine, a boss extending forward of the sleeve and at a level above at least a portion of the sleeve, the boss being adapted to be received in the rear aperture of the magazine tube, and a tang extending rearward of the sleeve and defining a tang aperture operable to receive a fastener associated with a shotgun frame to secure the magazine well to the shotgun with the sleeve proximate and aligned with the loading port when the boss is received in the rear aperture of the magazine tube. The boss may have a lower cylindrical surface portion operable to contact a lower portion of the magazine tube adjacent to the rear aperture. The boss may be a cylindrical body.

19 Claims, 24 Drawing Sheets



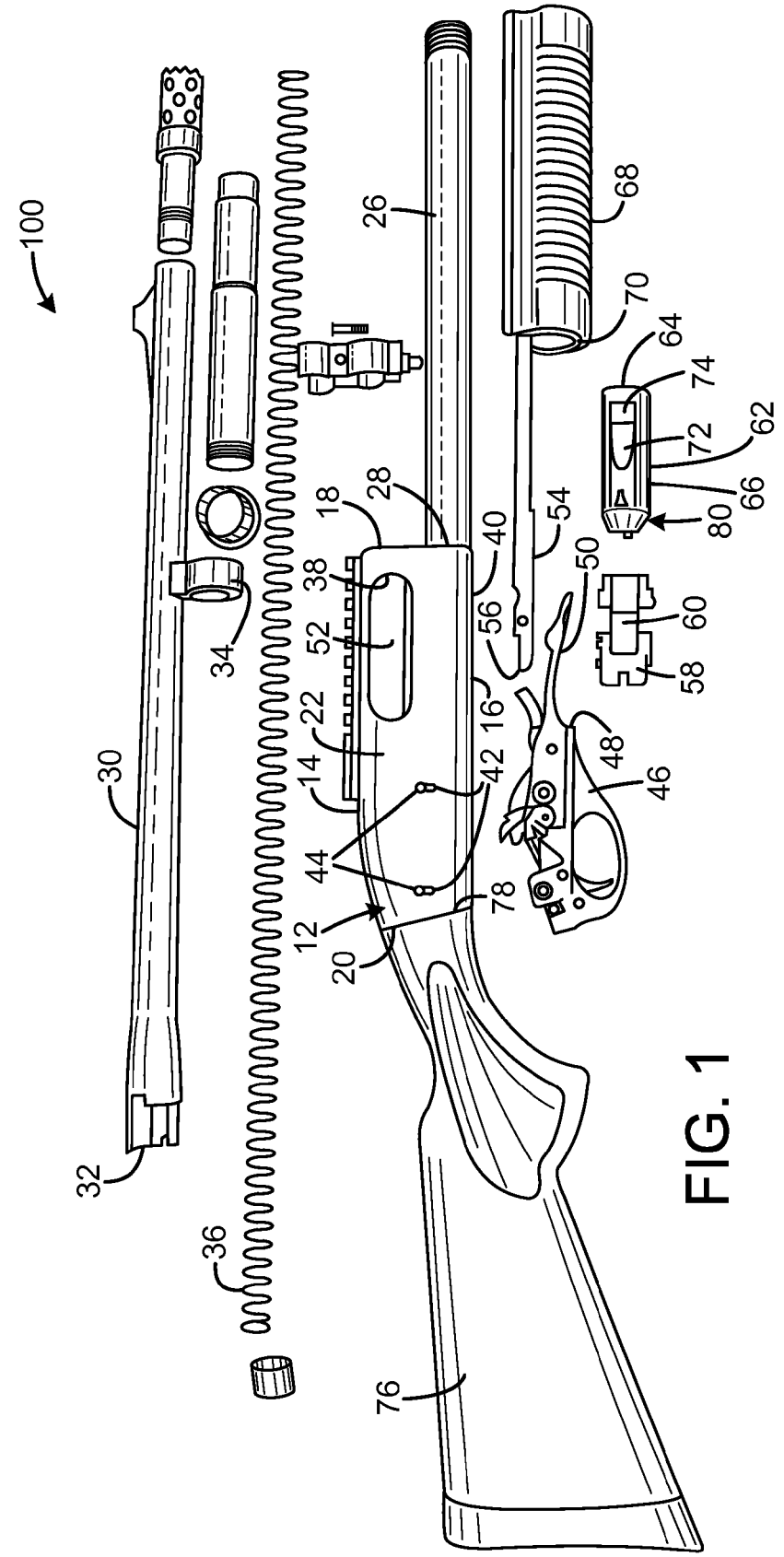

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FIG. 1

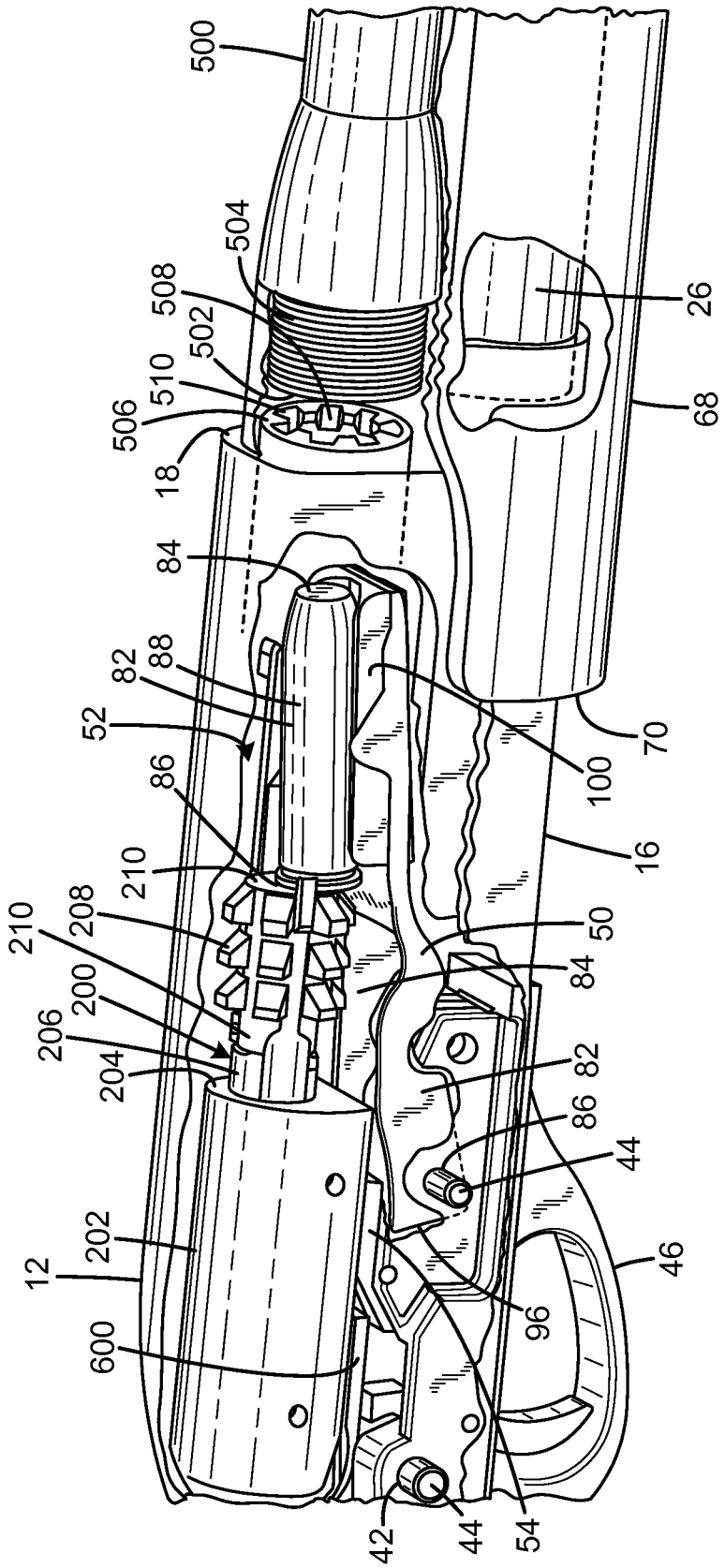
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FIG. 2

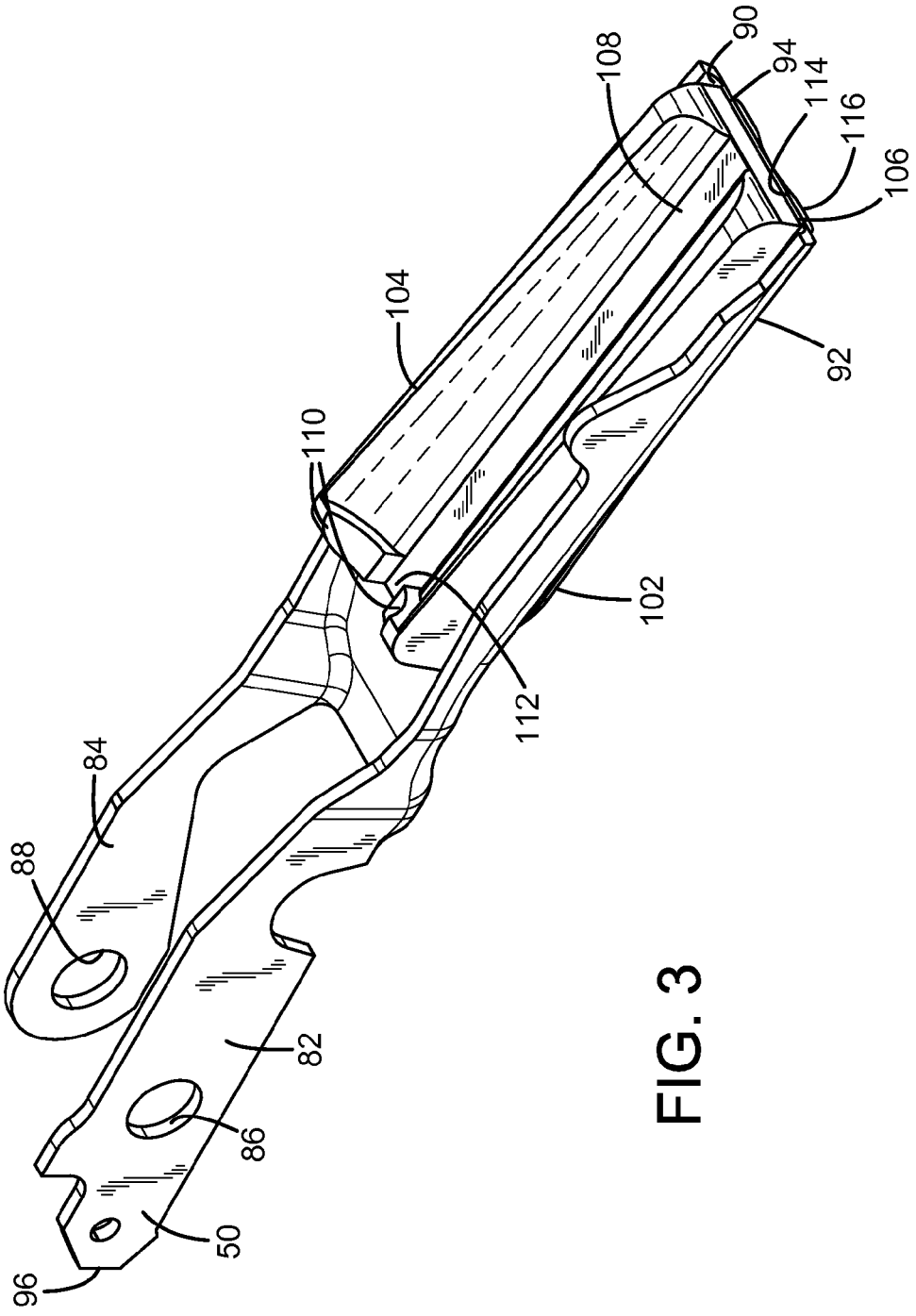

FIG. 3

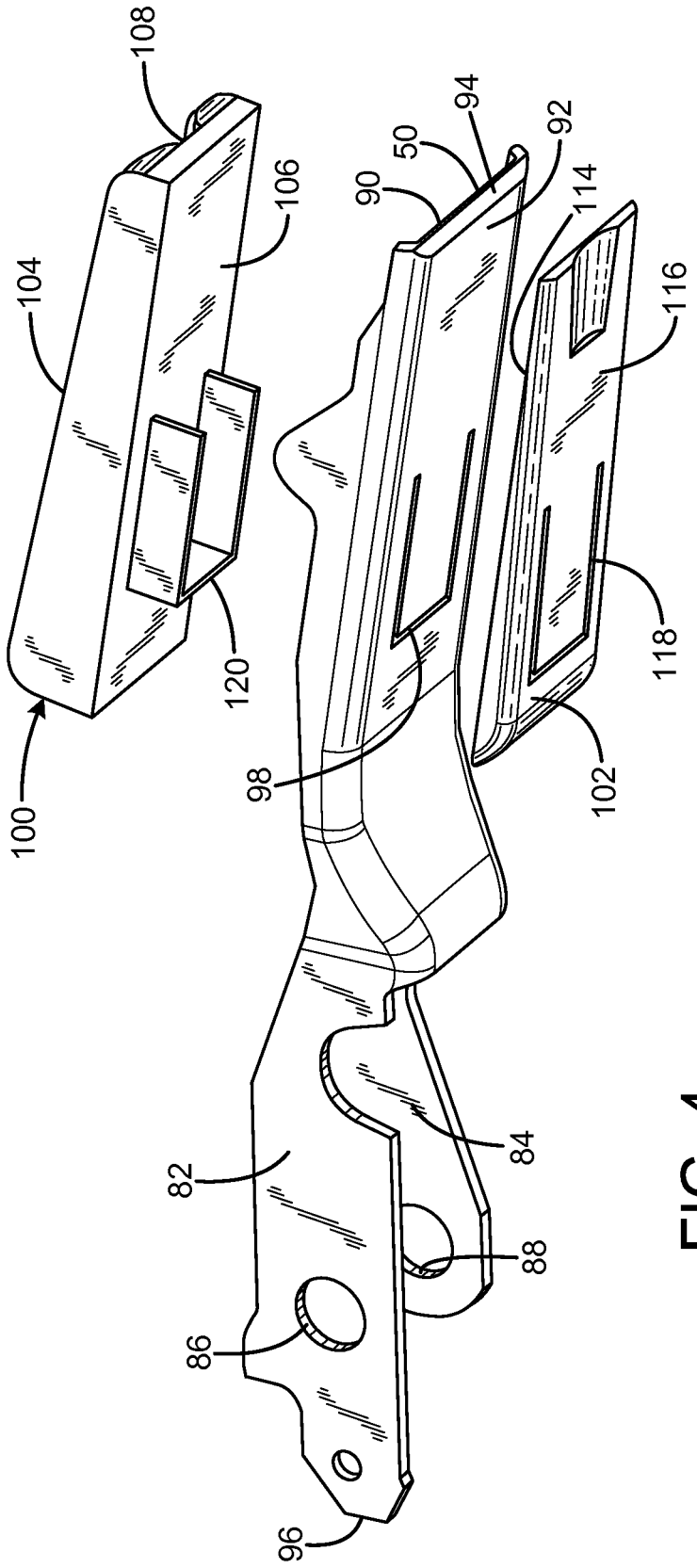

FIG. 4

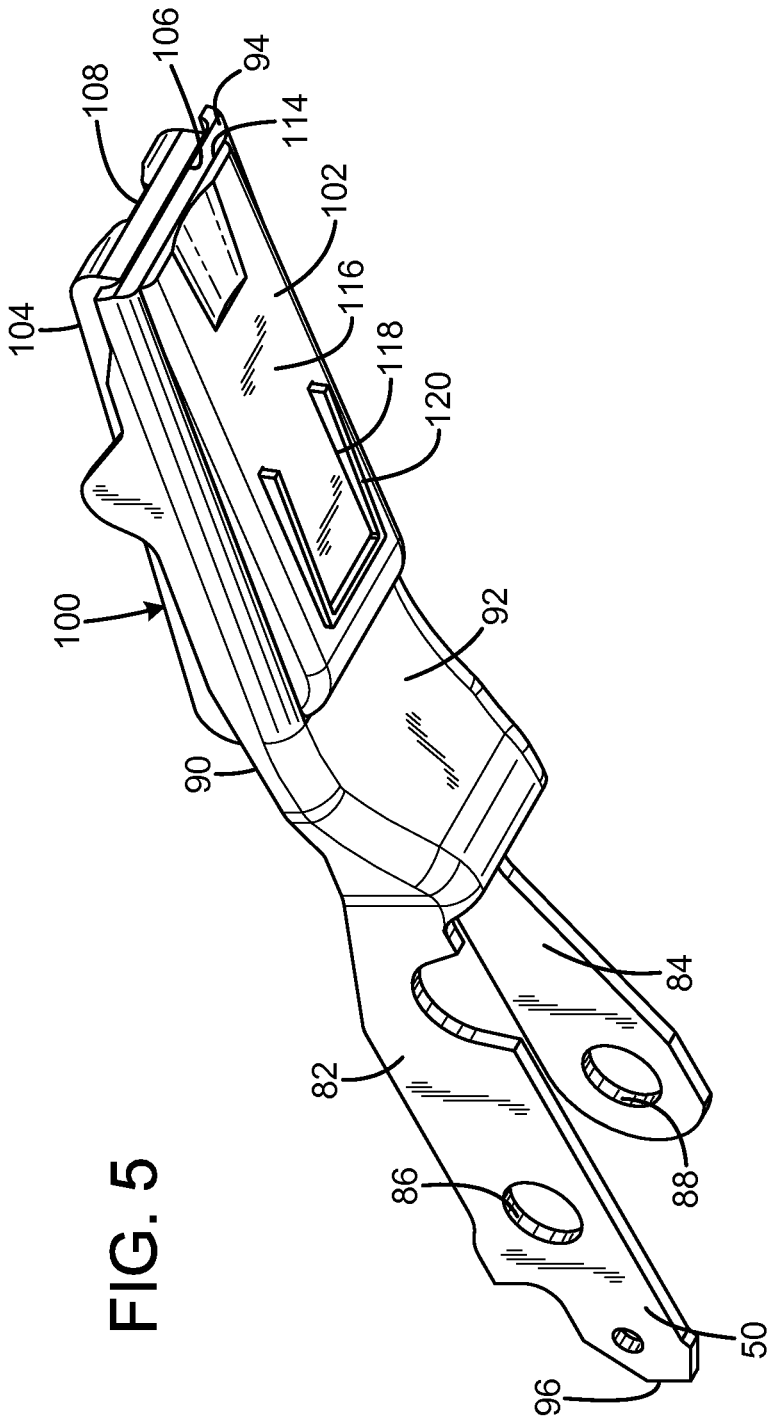

FIG. 5

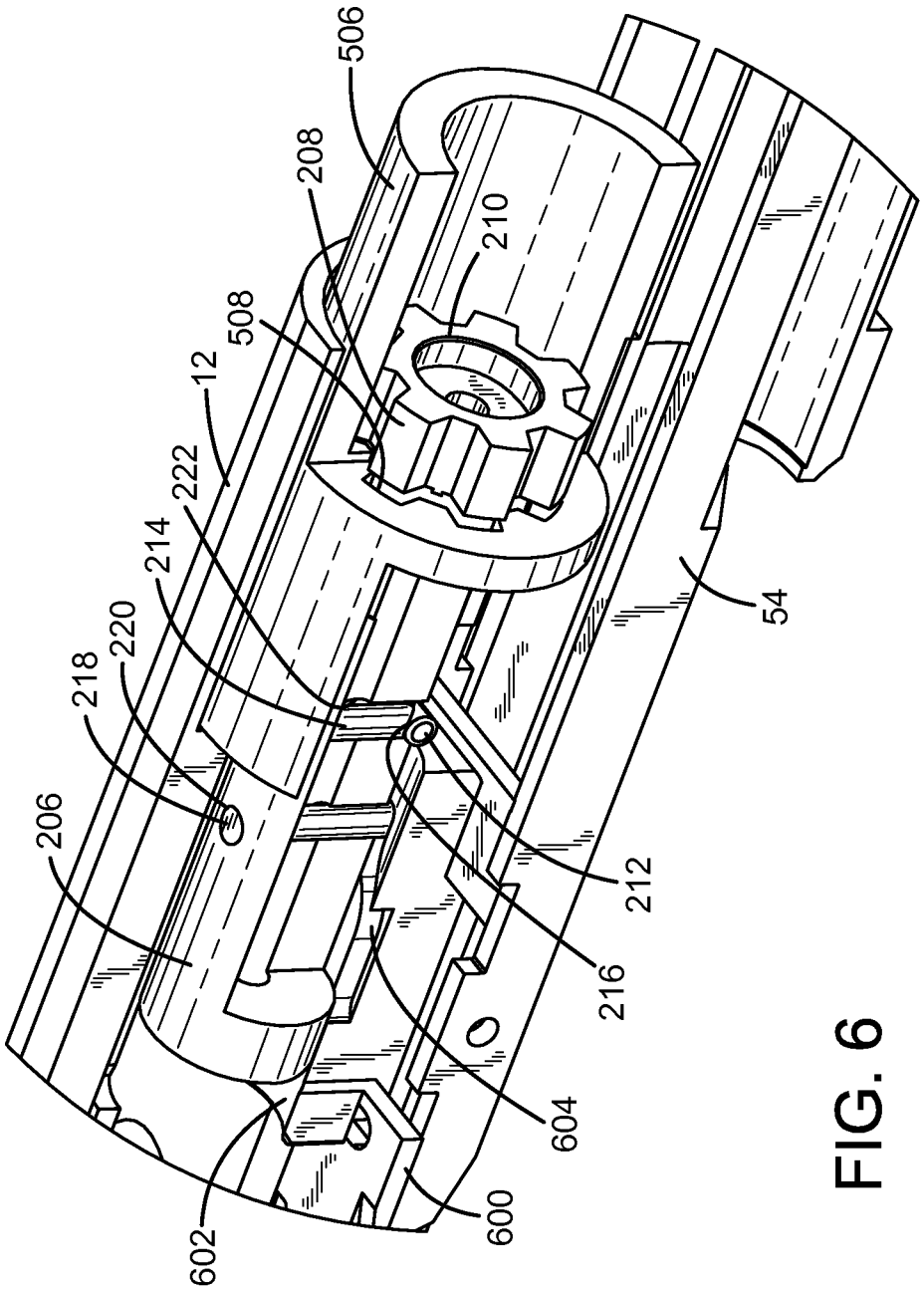

FIG. 6

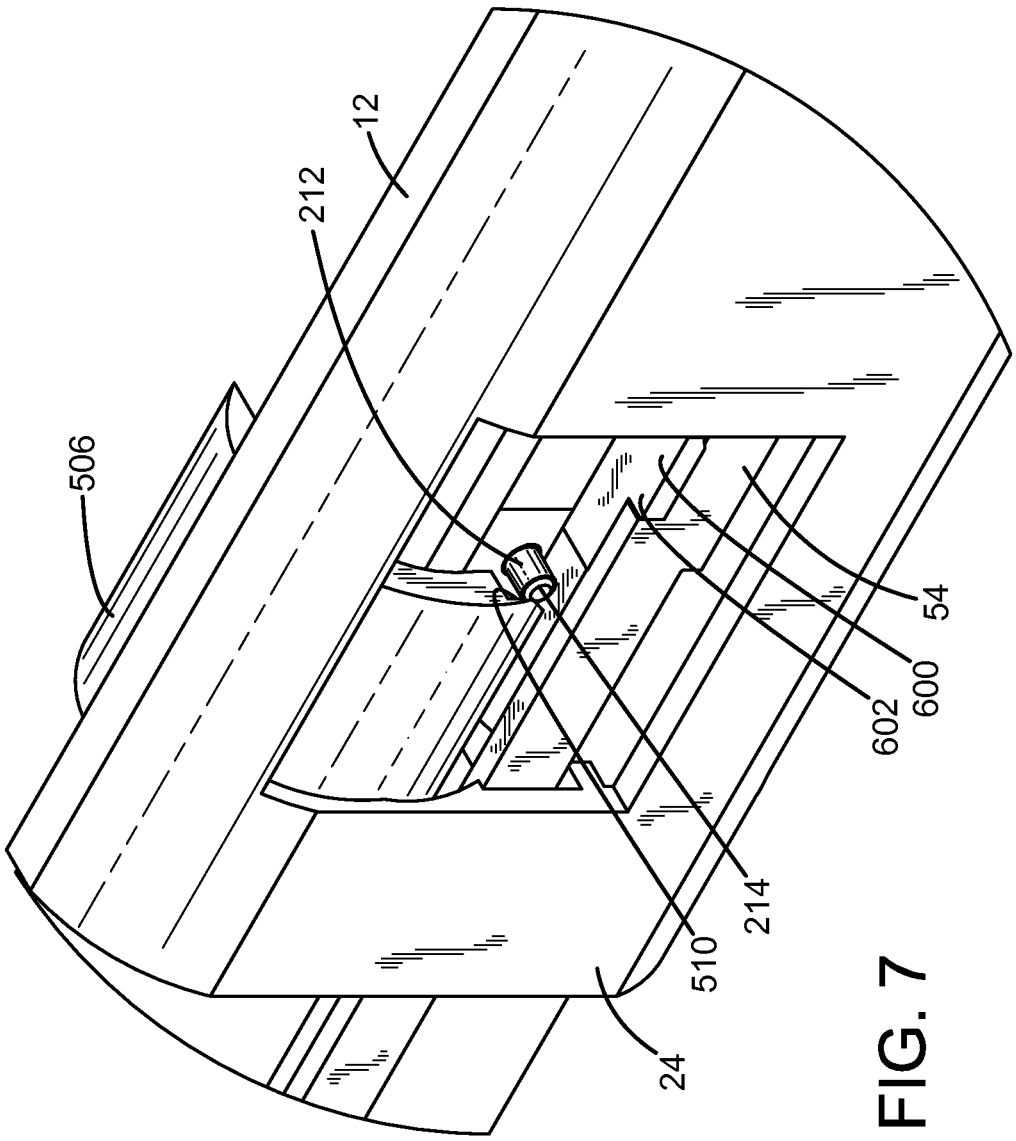

FIG. 7

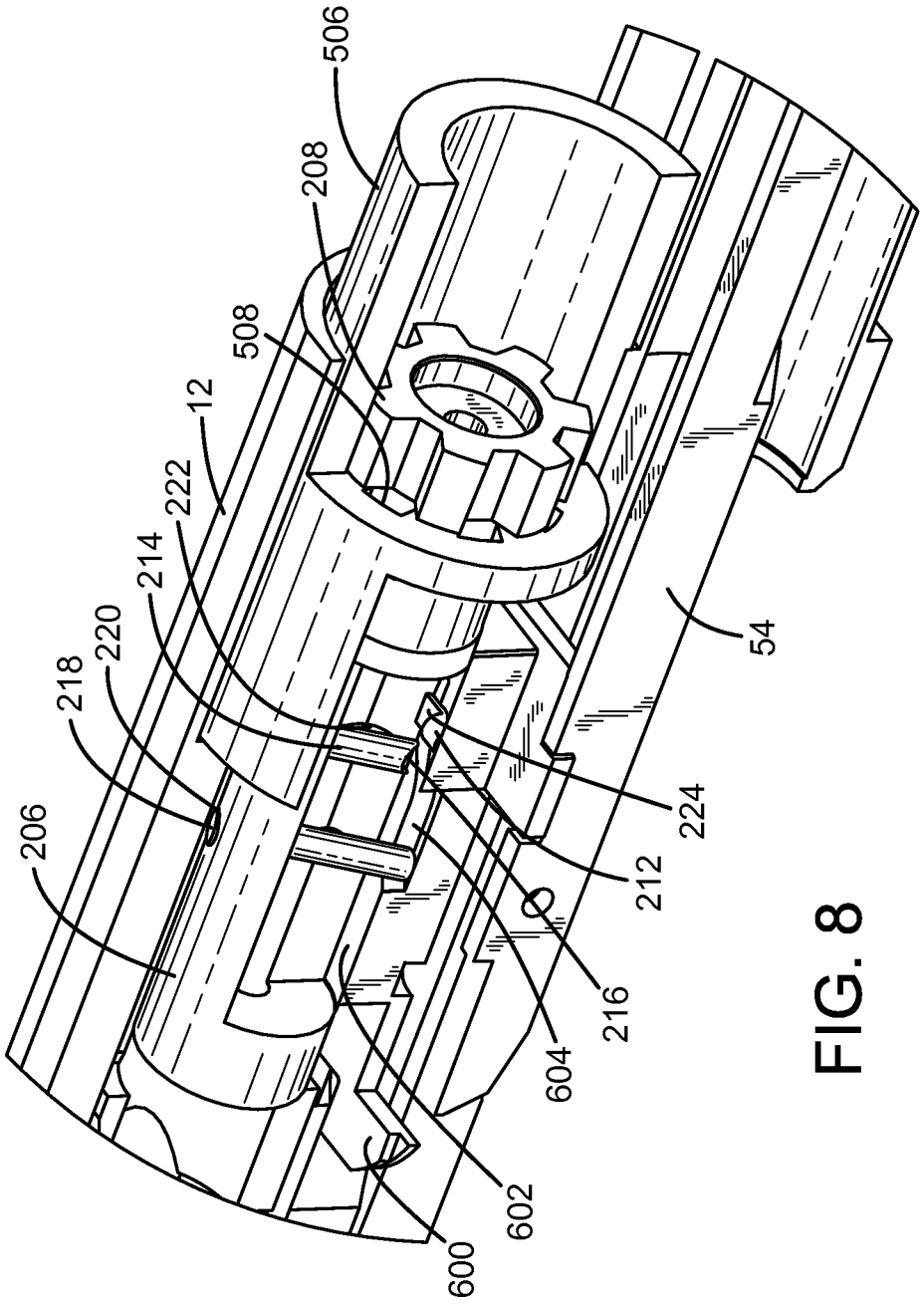

FIG. 8

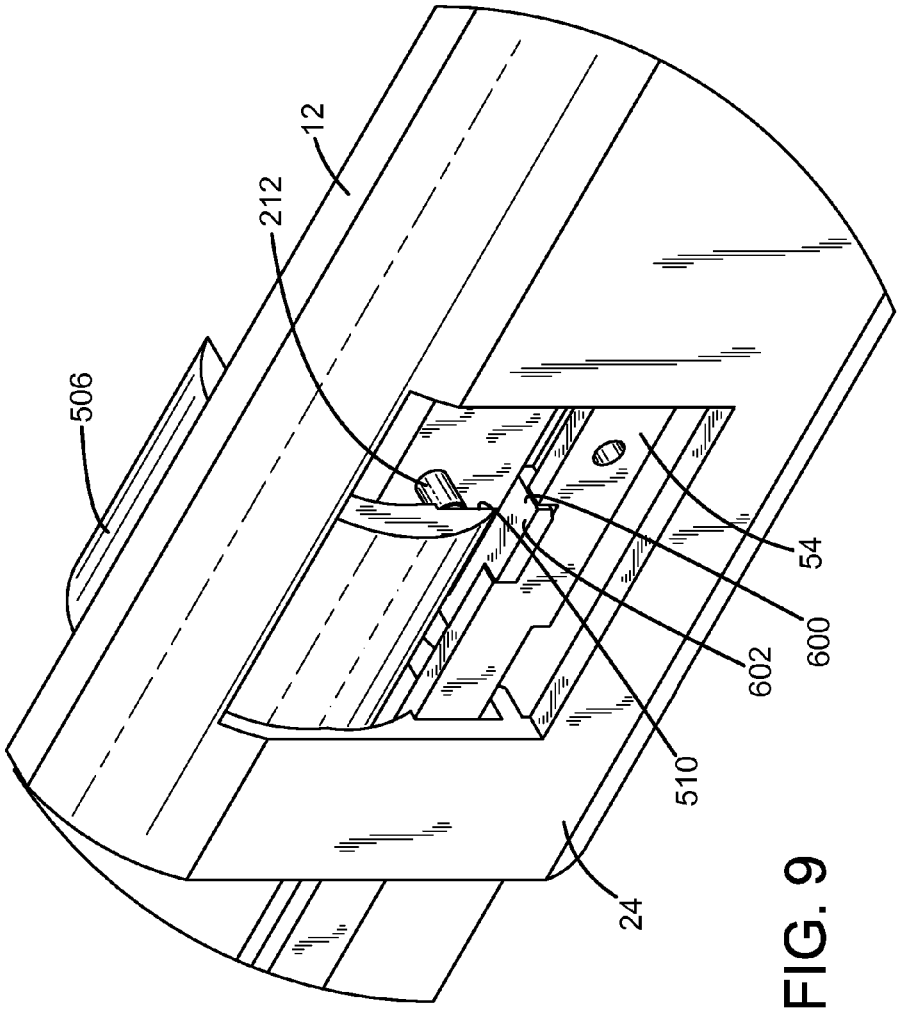

FIG. 9

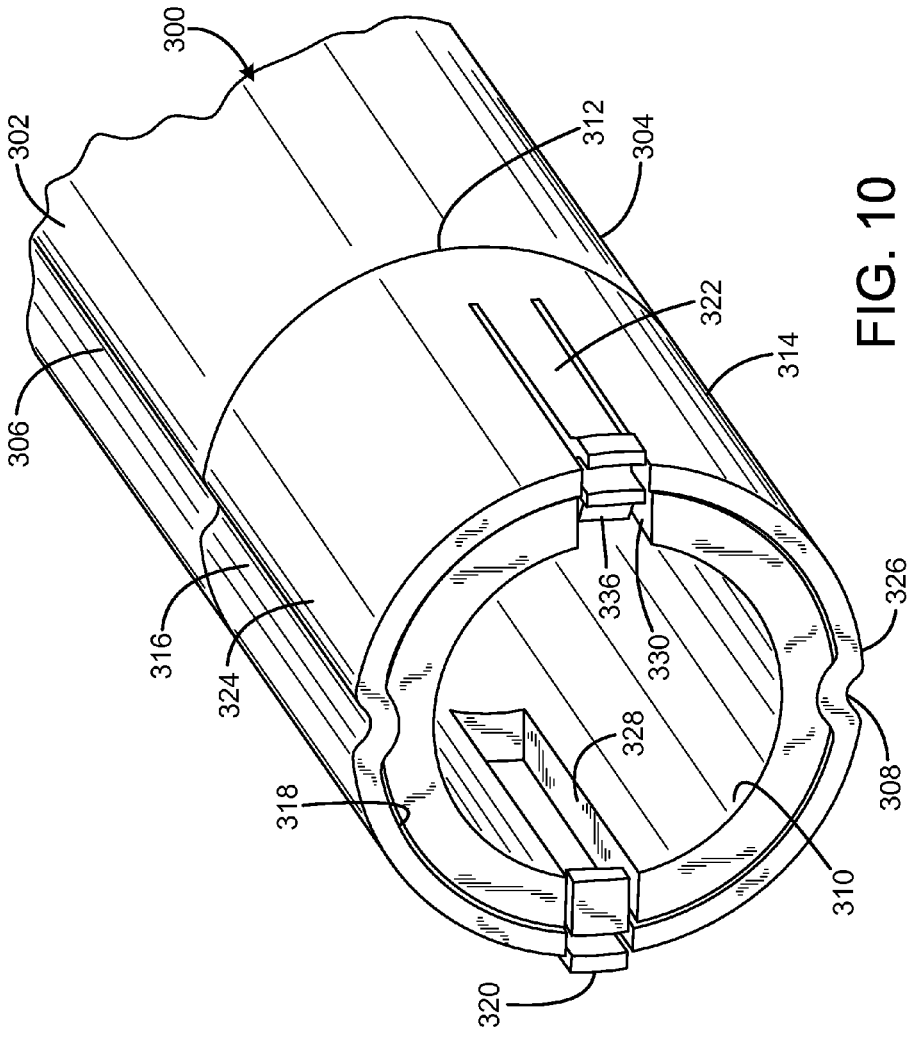
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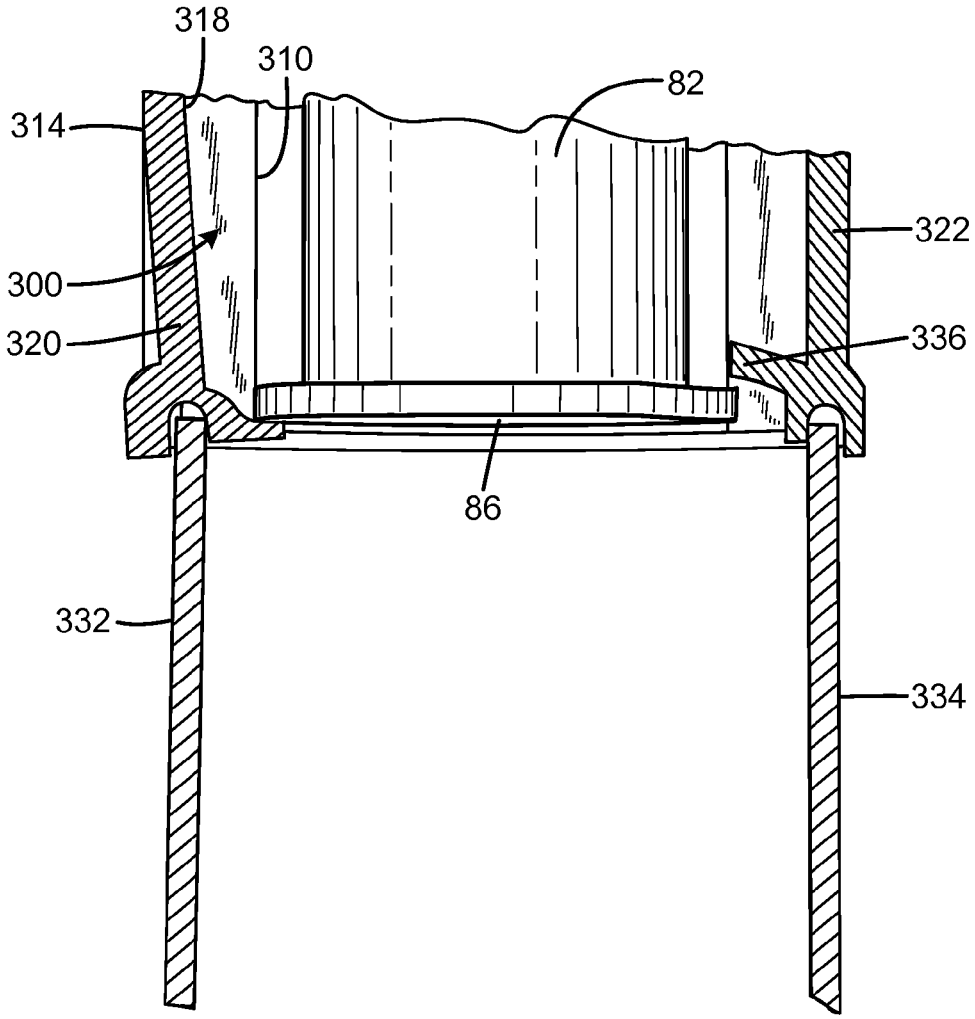
FIG. 10



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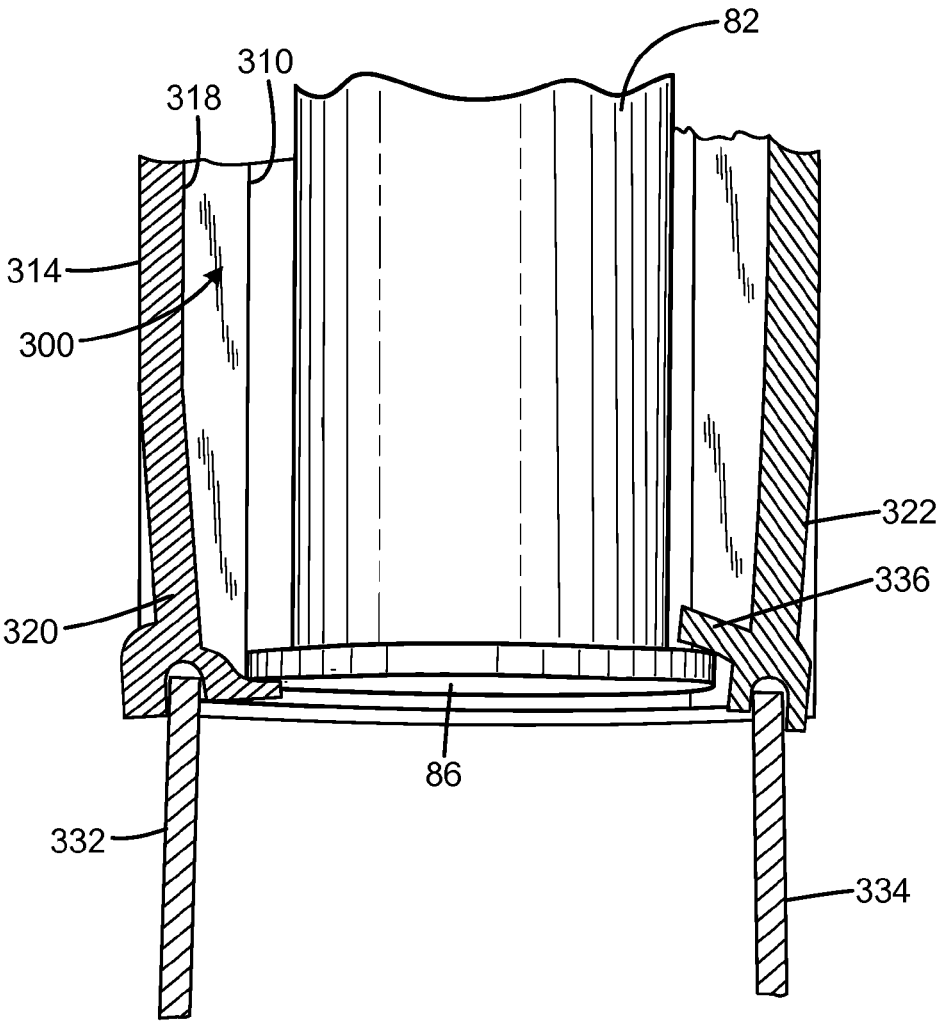

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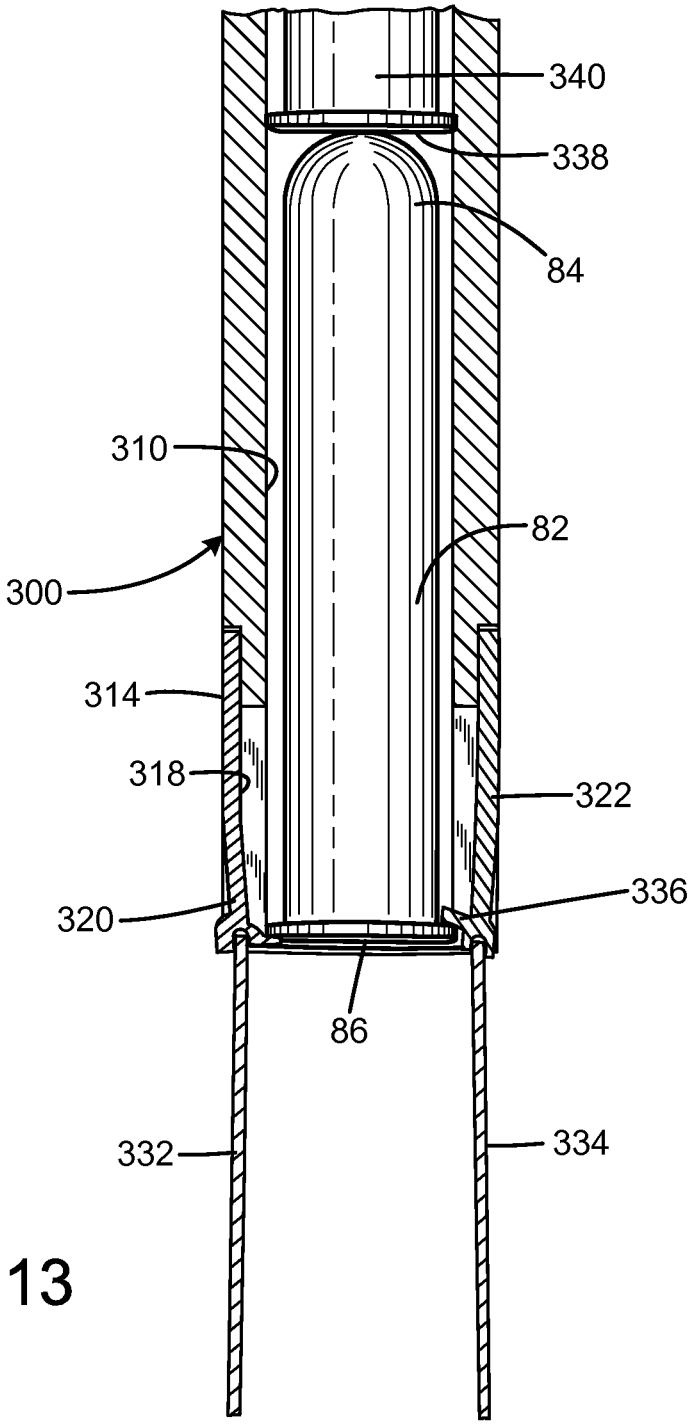


FIG. 13

FIG. 14

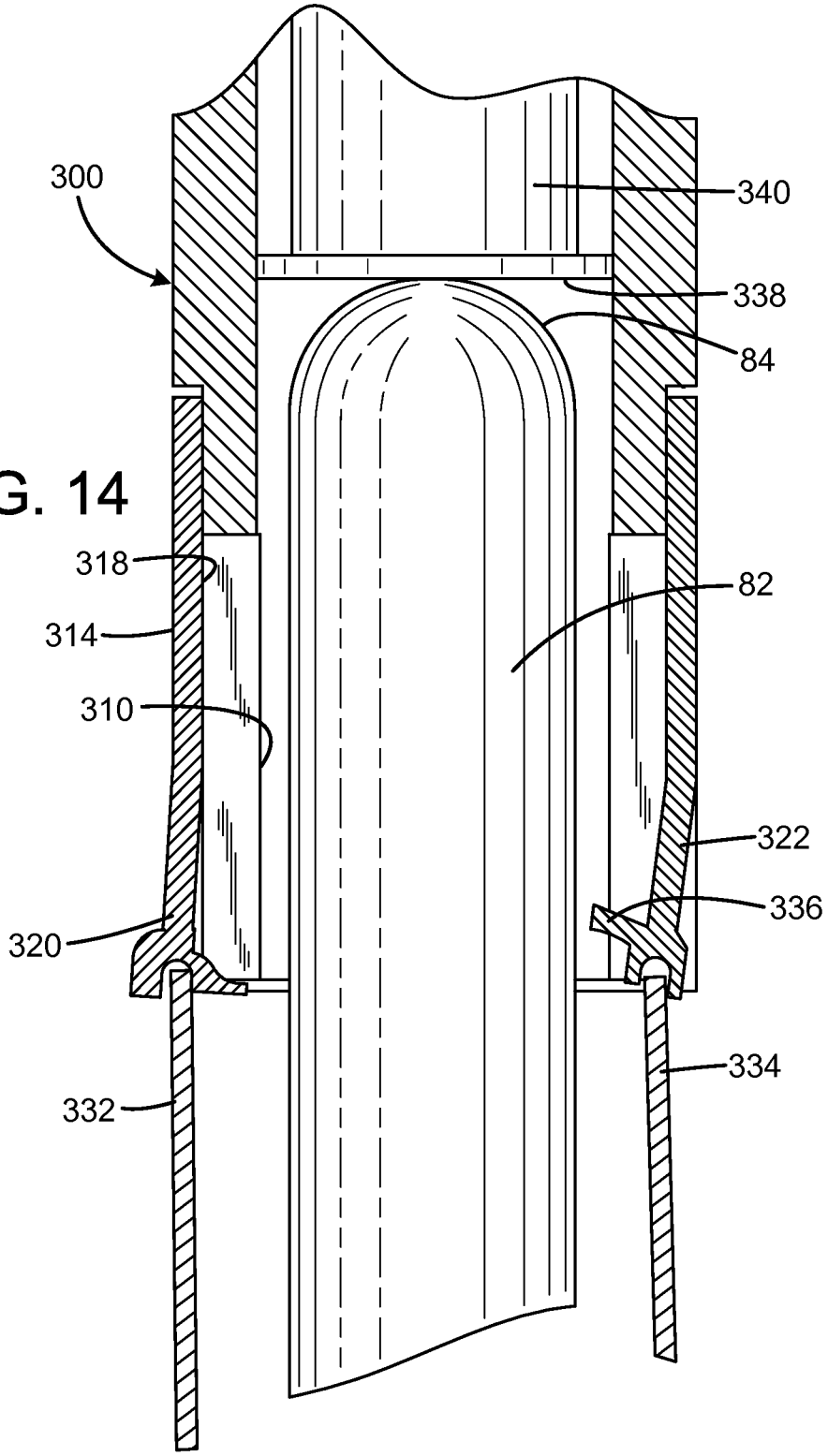
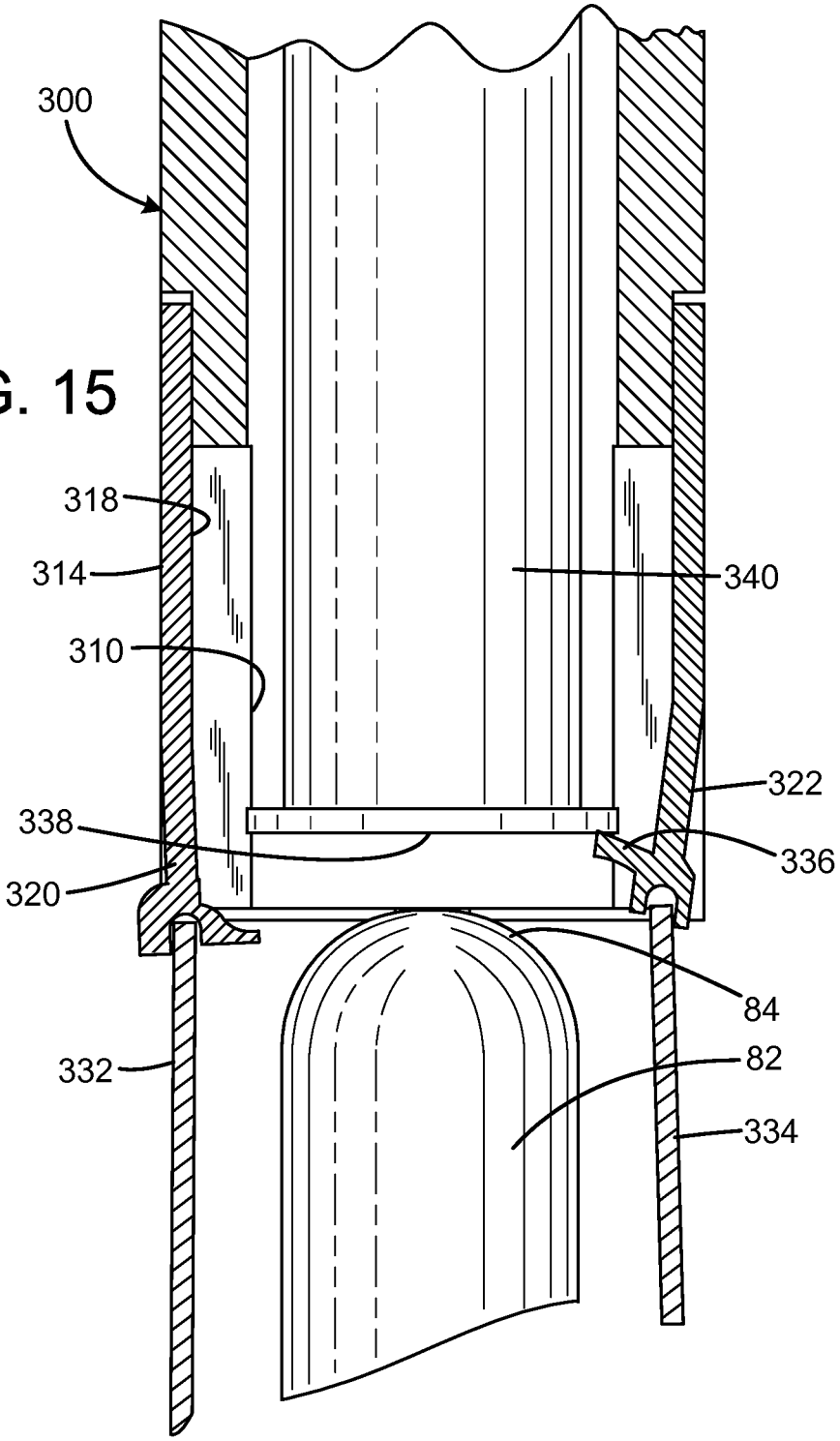
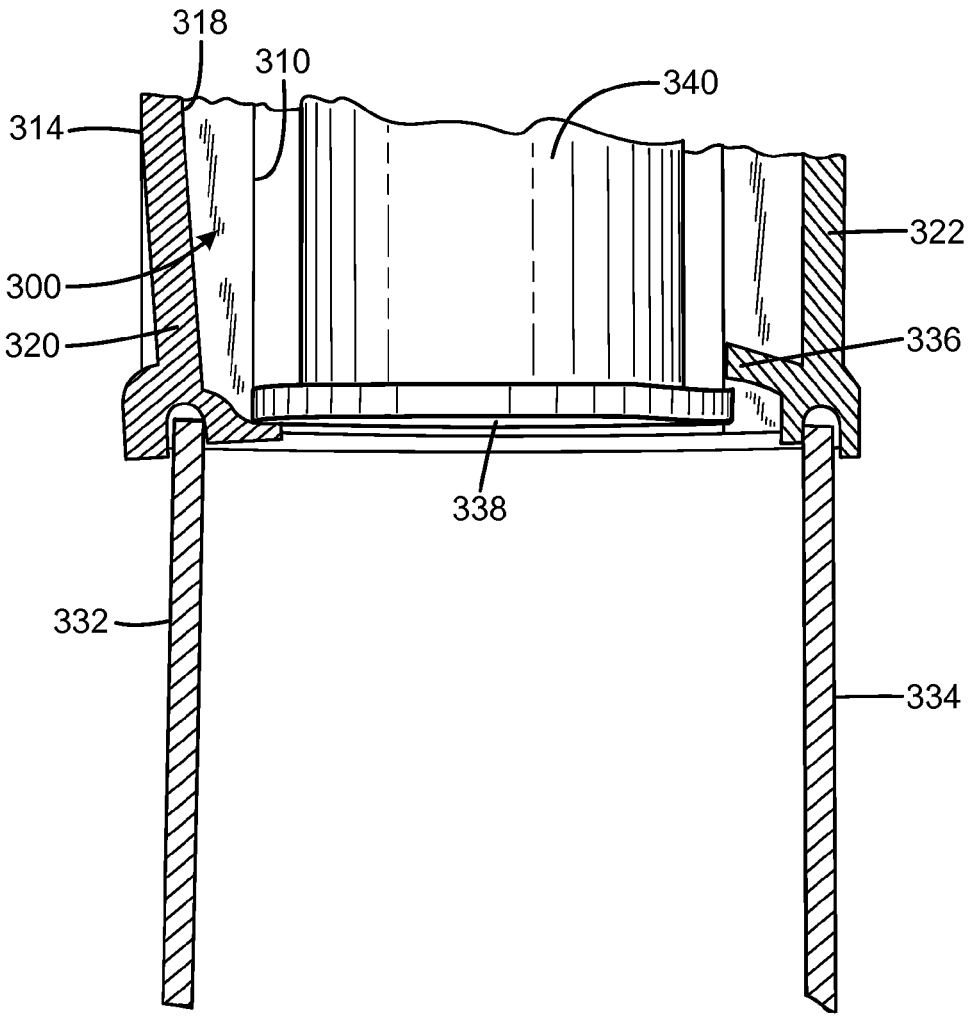


FIG. 15





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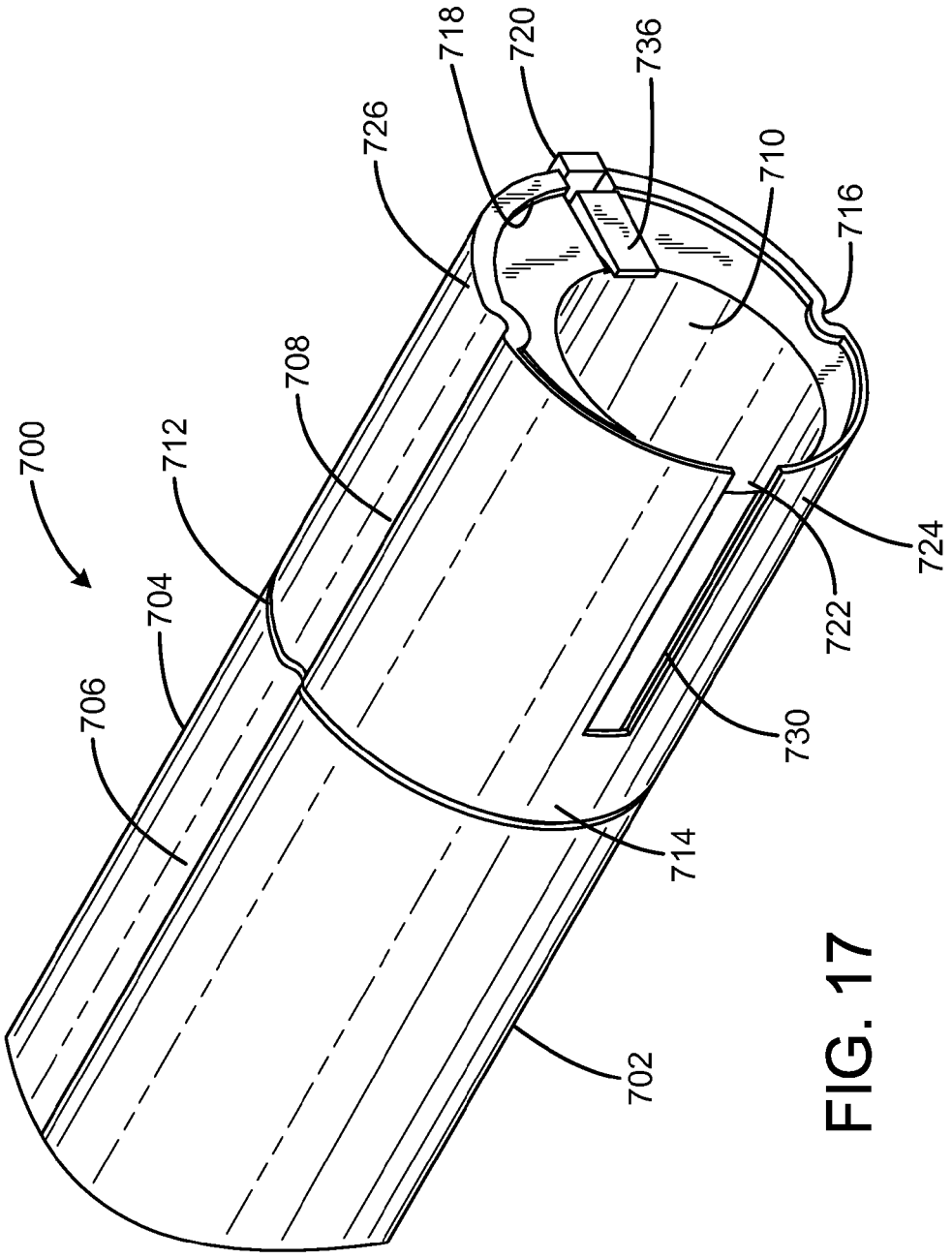

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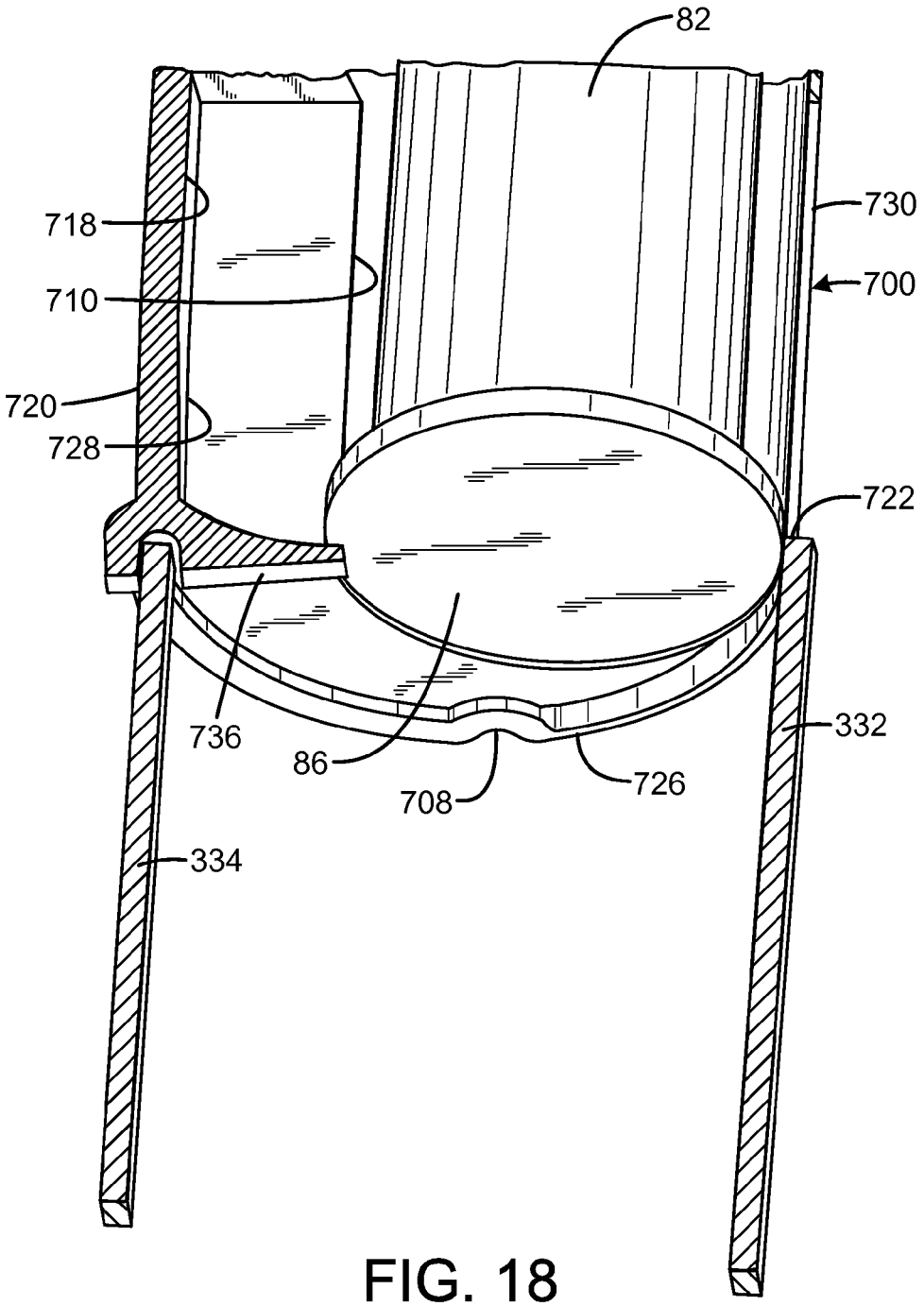
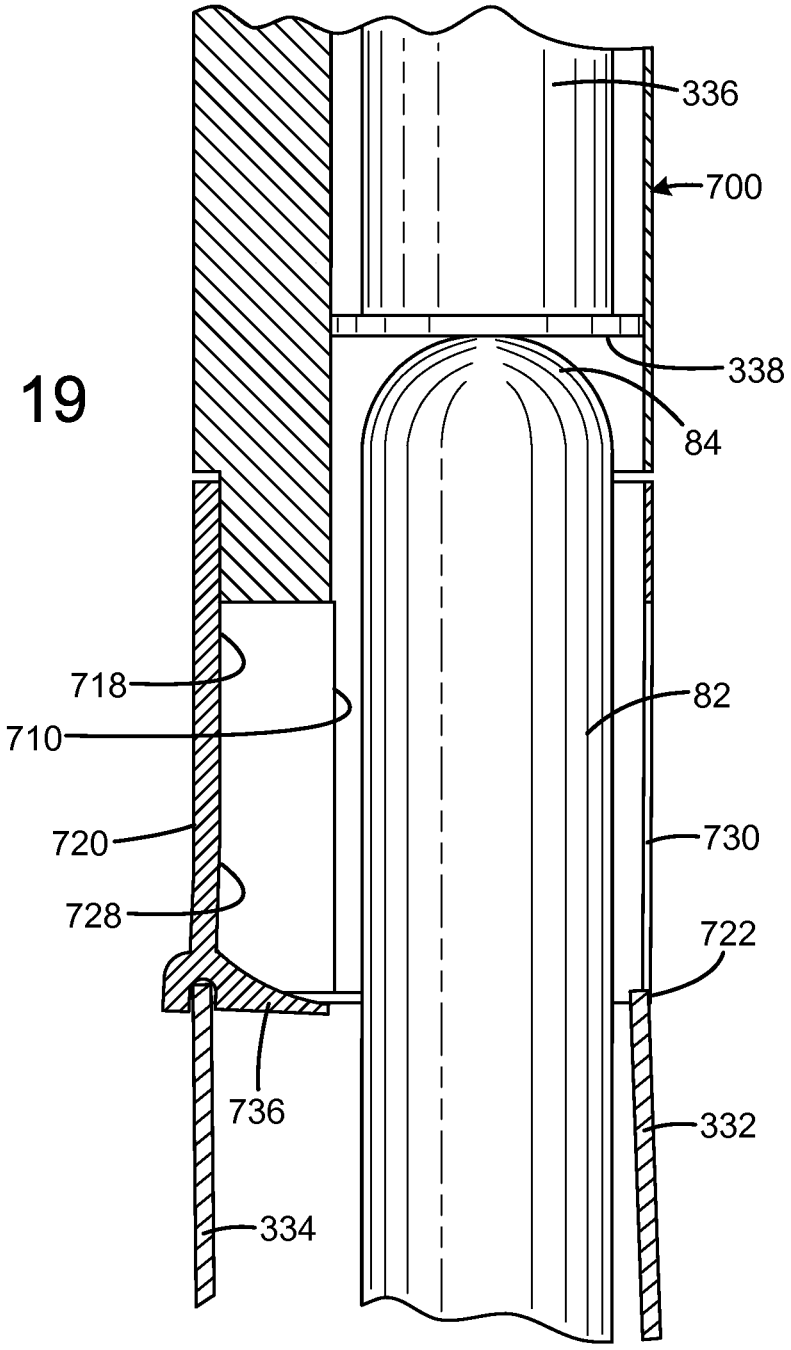
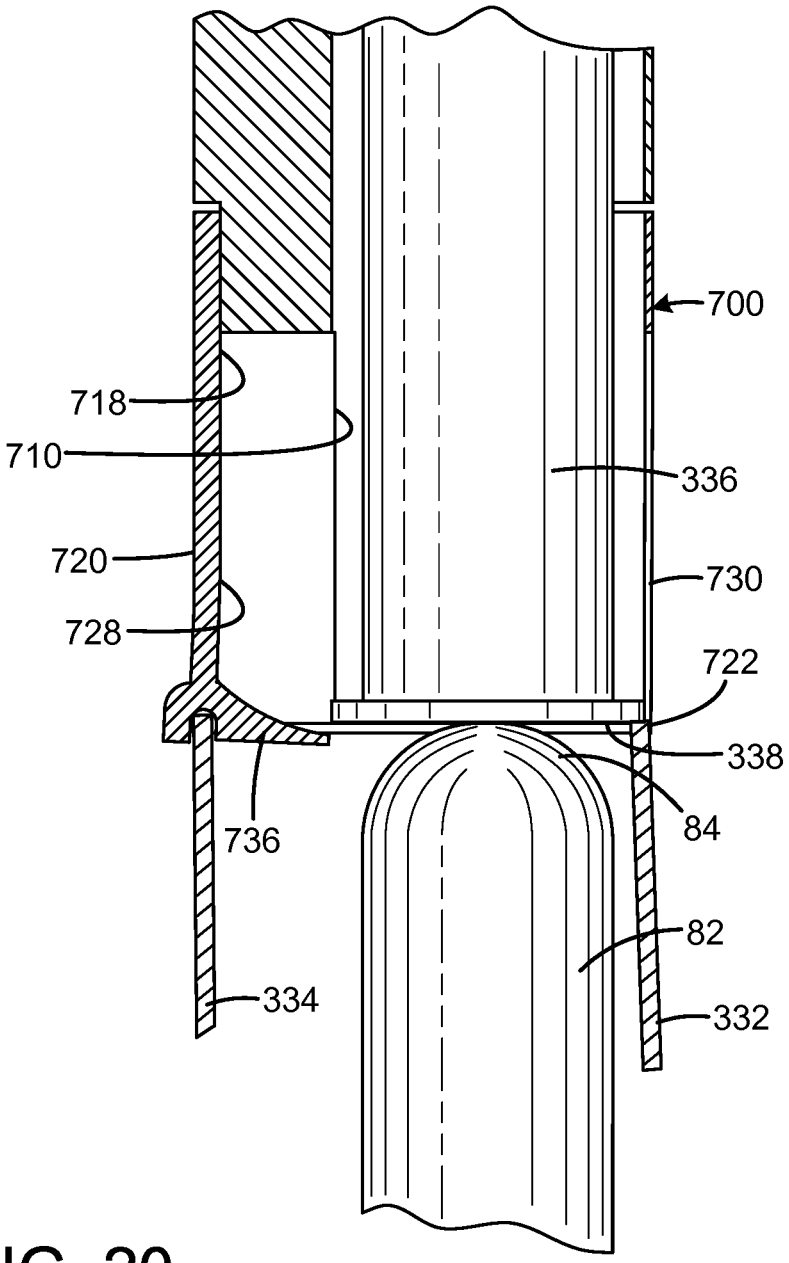


FIG. 18

FIG. 19





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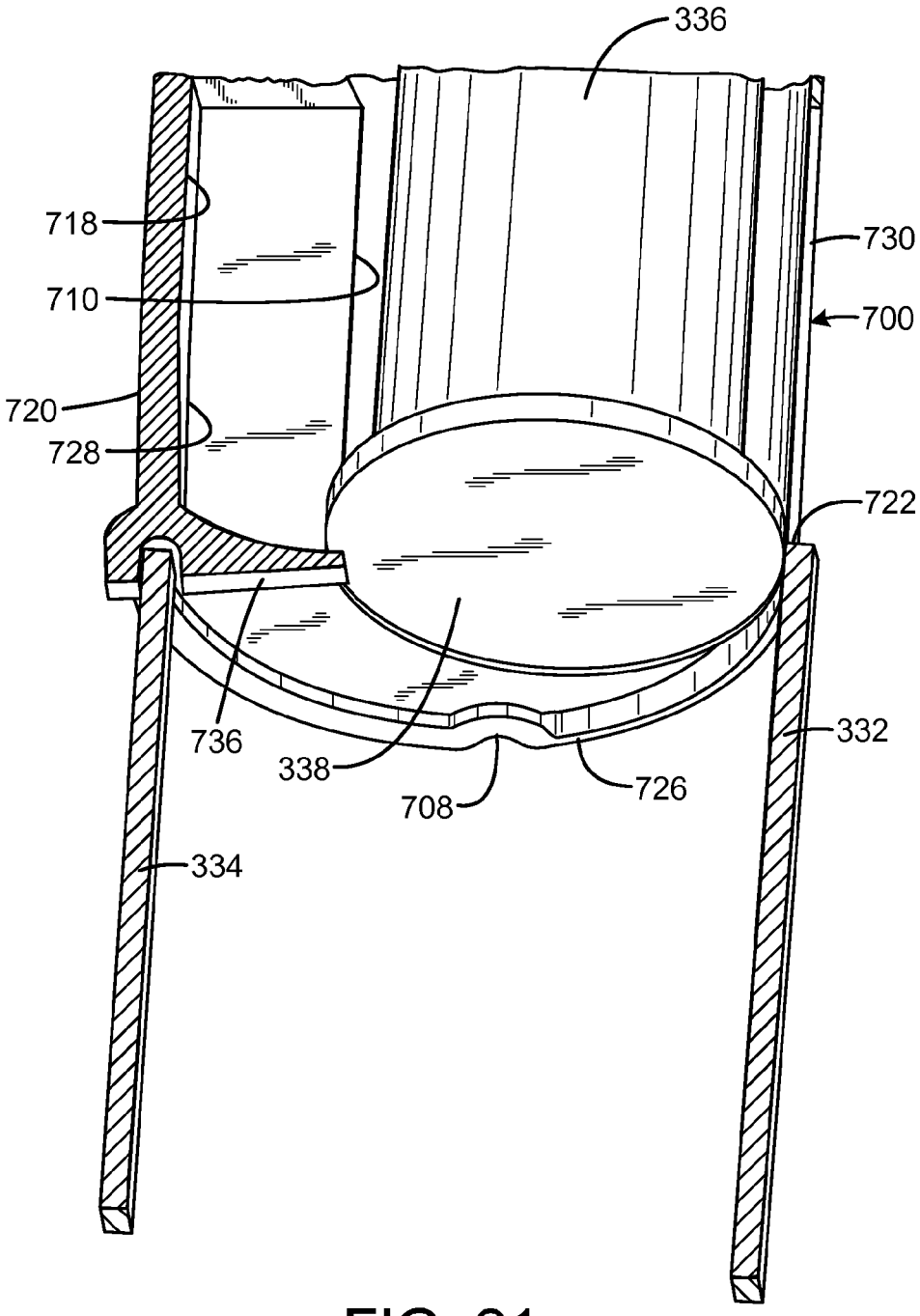

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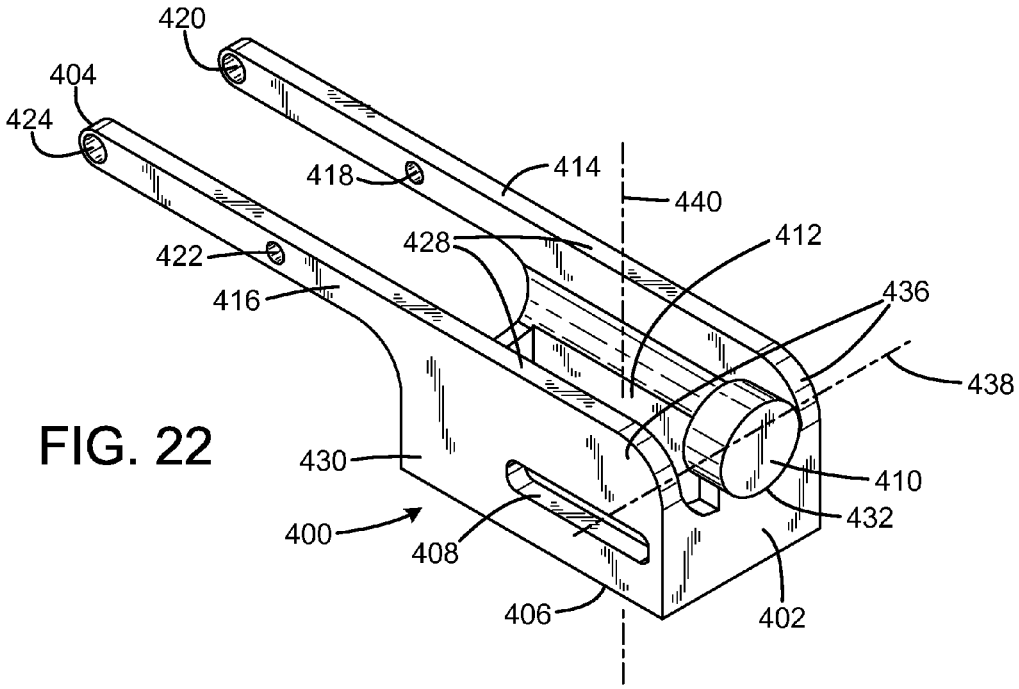
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FIG. 22

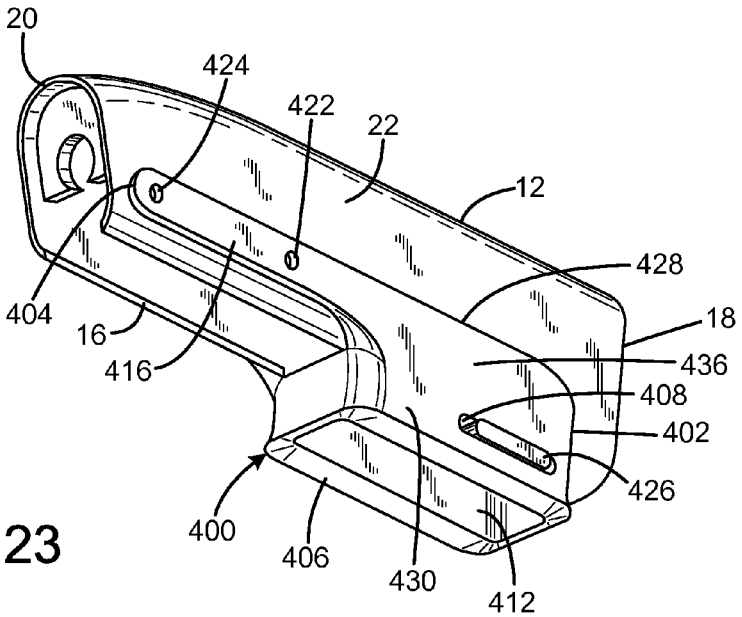
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FIG. 23

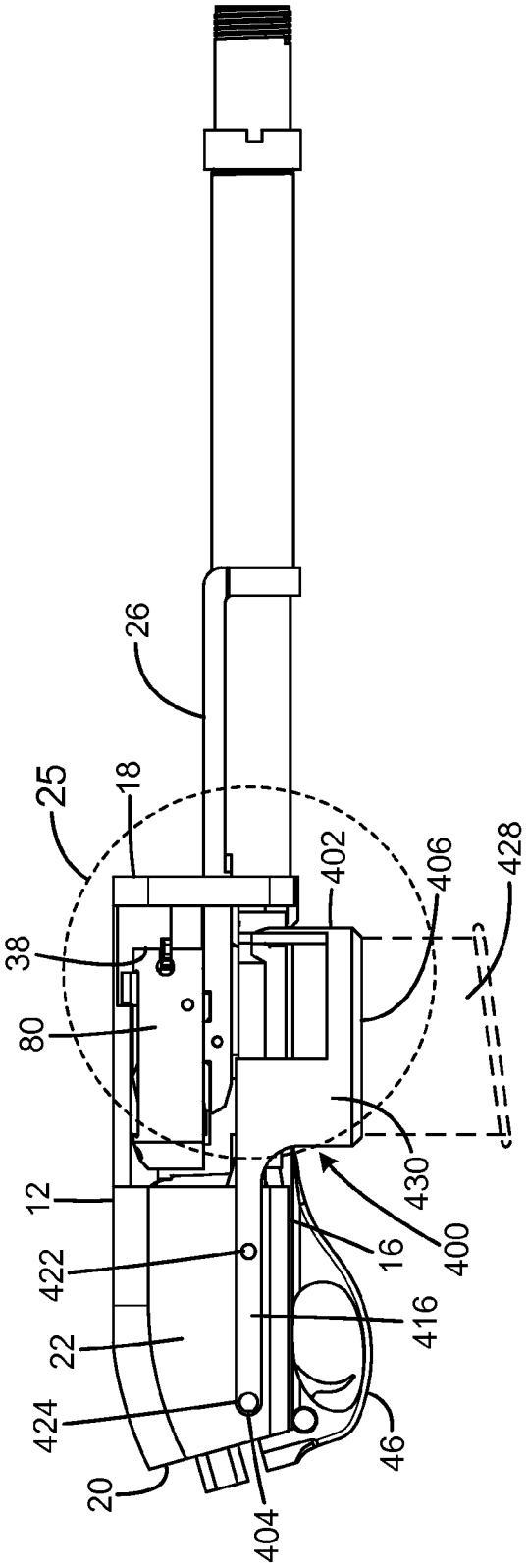

FIG. 24

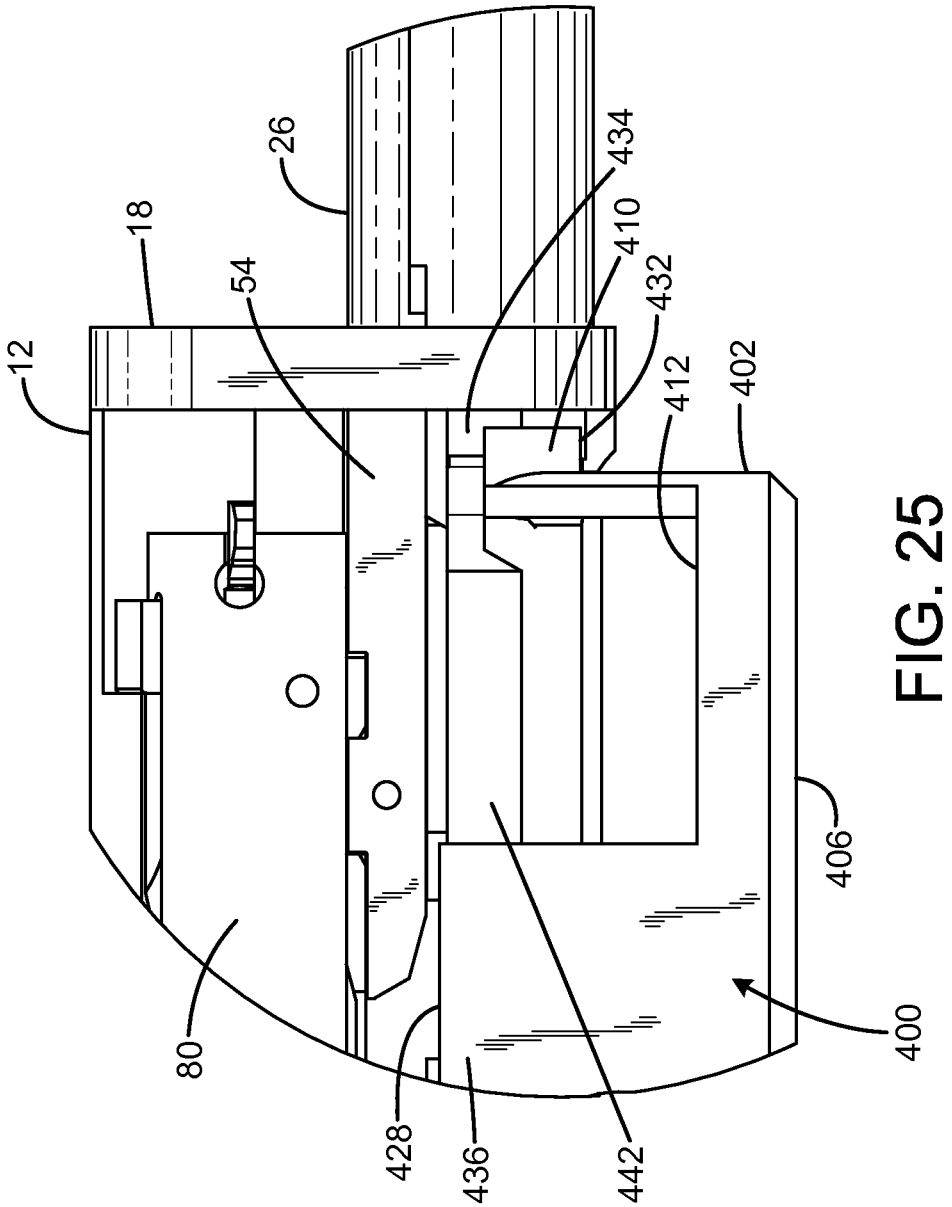

FIG. 25

SHOTGUN AMMUNITION CONVERSION SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority to U.S. Provisional Application Ser. No. 61/773,771 filed Mar. 6, 2013, and entitled "CONVERSION KITS" and to U.S. Provisional Application Ser. No. 61/774,528 filed Mar. 7, 2013, and entitled "CONVERSION KITS."

FIELD OF THE INVENTION

The present invention relates to firearms, and more particularly to a shotgun ammunition conversion system that converts a repeating shotgun into a repeating rifle capable of firing centerfire and rimfire cartridges.

BACKGROUND OF THE INVENTION

A shotgun is a firearm that uses the energy of a shotgun shell to fire a number of small spherical pellets called shot, or a solid projectile called a slug. One popular type of shotgun is the repeating pump-action shotgun. A conventional pump-action shotgun is one in which the handgrip or forend can be pumped back and forth in order to cycle the action to eject a spent round of ammunition and to chamber a fresh one. A pump-action shotgun is typically fed from a tubular magazine underneath the barrel, which also serves as a guide for the movable forend. The rounds are fed one by one into the action through a port in the receiver, where they are lifted by a lever called the shell lifter and are pushed forward into the chamber by the bolt. A pair of interrupters at the rear of the magazine holds the rounds in place to facilitate feeding of one shell at a time.

The forend is connected to the bolt by one or two bars (two bars are considered more reliable because they provide symmetric forces on the bolt and pump and reduce the chances of binding). The motion of the bolt back and forth in a tubular magazine model also operates the shell lifter, which lifts the shells from the level of the magazine to the level of the barrel. Modern pump shotgun designs have a safety feature called a trigger disconnector, which disconnects the trigger from the sear as the bolt moves back, so that the trigger must be released and pulled again to fire the shotgun after it closes.

After firing a round, the bolt is unlocked and the forend is free to move. The shooter pulls back on the forend to begin the operating cycle. The bolt unlocks and begins to move to the rear, which extracts and ejects the empty shell from the chamber, cocks the hammer, and begins to load the new shell. In a tubular magazine design, as the bolt moves rearwards, a single shell is released from the magazine and is pushed backwards to come to rest on the shell lifter.

As the forend reaches the rear and begins to move forward, the shell lifter lifts up the shell, lining it up with the barrel. As the bolt moves forward, the round slides into the chamber, and the final portion of the forend's travel locks the bolt into position. A pull of the trigger will fire the next round, where the cycle begins again.

A shotgun is generally a smoothbore firearm, which means that the inside of the barrel is not rifled. The shot pellets from a shotgun spread upon leaving the barrel, and the power of the burning charge is divided among the pellets, which means that the energy of any one ball of shot is fairly low. Shotguns are very popular for bird hunting. Shotguns can also be used for more general forms of hunting with slugs. Shotguns are often used with rifled barrels in locations where it is not lawful to hunt with a rifle. Typically, a sabot slug is used in these barrels for maximum accuracy and performance. However, the relatively low muzzle velocity of slug ammunition, and the blunt, poorly streamlined shape of typical slugs that causes them to lose velocity very rapidly compared to rifle bullets, limits the effectiveness of shotguns with many types of game.

Therefore, a need exists for a new and improved shotgun ammunition conversion system that converts a repeating shotgun into a repeating rifle capable of firing centerfire and rimfire cartridges. These larger caliber and higher-powered cartridges relative to shotgun shells enable shotgun users to hunt a wider variety of game while in the field without requiring the user to carry two separate guns. In this regard, the various embodiments of the present invention substantially fulfill at least some of these needs. In this respect, the shotgun ammunition conversion system according to the present invention substantially departs from the conventional concepts and designs of the prior art, and in doing so provides an apparatus primarily developed for the purpose of converting a repeating shotgun into a repeating rifle capable of firing centerfire and rimfire cartridges.

SUMMARY OF THE INVENTION

The present invention provides an improved shotgun ammunition conversion system, and overcomes the above-mentioned disadvantages and drawbacks of the prior art. As such, the general purpose of the present invention, which will be described subsequently in greater detail, is to provide an improved shotgun ammunition conversion system that has all the advantages of the prior art mentioned above.

To attain this, the preferred embodiment of the present invention essentially comprises a detachable magazine well having a sleeve defining a rectangular passage adapted to removably receive an ammunition magazine, a boss extending forward of the sleeve and at a level above at least a portion of the sleeve, the boss being adapted to be received in the rear aperture of the host shotgun's magazine tube, and a tang extending rearward of the sleeve and defining a tang aperture operable to receive a fastener associated with a shotgun frame to secure the magazine well to the shotgun with the sleeve proximate and aligned with the loading port when the boss is received in the rear aperture of the magazine tube. The boss may have a lower cylindrical surface portion operable to contact a lower portion of the magazine tube adjacent to the rear aperture. The boss may be a cylindrical body. There are, of course, additional features of the invention that will be described hereinafter and which will form the subject matter of the claims attached.

There has thus been outlined, rather broadly, the more important features of the invention in order that the detailed description thereof that follows may be better understood and in order that the present contribution to the art may be better appreciated.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a right side view of a prior art pump-action shotgun.

FIG. **2** is an enlarged cutaway view of the current embodiment of a shotgun ammunition conversion system constructed in accordance with the principles of the present invention installed in a receiver of the shotgun of FIG. **1**.

FIG. **3** is a top isometric view of a current embodiment of a shell lifter adapter of the present invention attached to a shell lifter of the shotgun of FIG. **1**.

FIG. **4** is an exploded view of the shell lifter adapter of FIG. **3**.

FIG. **5** is a bottom isometric view of the shell lifter adapter of FIG. **3**.

FIG. **6** is an enlarged cutaway right side view of a bolt, shoe, and barrel extension of the present invention installed in a receiver of the shotgun of FIG. **1** in a first position.

FIG. **7** is an enlarged cutaway left side view of FIG. **6**.

FIG. **8** is an enlarged cutaway right side view of a bolt, shoe, and barrel extension of the present invention installed in a receiver of the shotgun of FIG. **1** in a second position forward of the first position of FIG. **6**.

FIG. **9** is an enlarged cutaway left side view of FIG. **8**.

FIG. **10** is a rear isometric partial view of a current embodiment of a magazine tube adapter of the present invention.

FIG. **11** is a top enlarged sectional view of the magazine tube adapter of FIG. **11** with the forend of the shotgun of FIG. **1** in the forwardmost position.

FIG. **12** is a top enlarged sectional view of the magazine tube adapter of FIG. **11** with the forend of the shotgun of FIG. **1** in the halfway retracted position.

FIG. **13** is a top partial sectional view of the magazine tube adapter of FIG. **12**.

FIG. **14** is a top enlarged sectional view of the magazine tube adapter of FIG. **11** with the forend of the shotgun of FIG. **1** in the rearwardmost position with the rearmost cartridge partially pushed onto the shell lifter adapter of FIG. **3**.

FIG. **15** is a top enlarged sectional view of the magazine tube adapter of FIG. **11** with the forend of the shotgun of FIG. **1** in the rearwardmost position with the rearmost cartridge fully pushed onto the shell lifter adapter of FIG. **3**.

FIG. **16** is a top enlarged sectional view of the magazine tube adapter of FIG. **11** with the forend of the shotgun of FIG. **1** returned to the forwardmost position.

FIG. **17** is a rear isometric partial view of an alternative embodiment of a magazine tube adapter of the present invention.

FIG. **18** is a bottom enlarged sectional view of the magazine tube adapter of FIG. **17** with the forend of the shotgun of FIG. **1** in the forwardmost position.

FIG. **19** is a bottom enlarged sectional view of the magazine tube adapter of FIG. **17** with the forend of the shotgun of FIG. **1** in the rearwardmost position with the rearmost cartridge partially pushed onto the shell lifter adapter of FIG. **3**.

FIG. **20** is a bottom enlarged sectional view of the magazine tube adapter of FIG. **17** with the forend of the shotgun of FIG. **1** in the rearwardmost position with the rearmost cartridge fully pushed onto the shell lifter adapter of FIG. **3**.

FIG. **21** is a bottom enlarged sectional view of the magazine tube adapter of FIG. **17** with the forend of the shotgun of FIG. **1** returned to the forwardmost position.

FIG. **22** is a top isometric view of a current embodiment of the magazine adapter of the present invention.

FIG. **23** is a bottom isometric view of the magazine adapter of FIG. **22** installed on the receiver of the shotgun of FIG. **1**.

FIG. **24** is a right side sectional view of the magazine adapter of FIG. **22** installed on the receiver of the shotgun of FIG. **1**.

FIG. **25** is an enlarged sectional view taken along line **25** of FIG. **24**.

The same reference numerals refer to the same parts throughout the various figures.

DESCRIPTION OF THE CURRENT EMBODIMENT

Embodiments of a shotgun conversion system of the present invention are shown and generally designated by the reference numerals **100**, **200**, **300**, **400**, **500**, **600**, and **700**.

FIG. **1** illustrates a prior art shotgun **10** suitable for use with the present invention. More particularly, the shotgun is a conventional pump-action repeating shotgun such as the Model 870™ manufactured by Remington Arms Company, LLC of Madison, N.C. and the Mossberg® 500 and Mossberg® 590 manufactured by O.F. Mossberg & Sons, Inc. of North Haven, Conn. The shotgun has a frame or receiver **12** having a top **14**, bottom **16**, front **18**, rear **20**, right side **22**, and left side **24** (shown in FIG. **7**). The right side of the receiver defines an ejection port **38**, and the bottom of the receiver defines a loading port **40**. The right side of the receiver defines two takedown pin apertures **42** that receive takedown pins **44** to releasably secure a trigger assembly **46** to the bottom of the receiver. A shell lifter **50** is pivotally attached to the front **48** of the trigger assembly by the forwardmost takedown pin **44**.

The receiver **12** has an interior **52** in communication with the ejection port **38**, loading port **40**, and the front **18**. The rear **56** of a bolt slide **54** is slidably inserted into the interior of the receiver through the front. A shoe **58** is attached to the rear of the bolt slide. A bolt assembly **80** including a bolt carrier **62** and a bolt **72** is attached to the shoe. The bottom **66** of the bolt carrier is attached to the top **60** of the shoe such that the front **64** of the bolt carrier faces towards the front of the receiver. The bolt carrier has a hollow interior **74** that receives the bolt. The rear **70** of a forend **68** is attached to the bolt slide in front of the bolt assembly. When the forend is pumped forward to chamber a round, the shoe slides forward and pushes a single locking lug upwards to place the bolt into battery.

The rear **28** of a magazine tube **26** and the rear **32** of a barrel **30** are connected to the front **18** of the receiver **12**. The barrel has a barrel ring **34** that slides over the magazine tube, indexes the barrel, and holds the barrel in place. A magazine tube spring with follower **36** is received within the magazine tube. The front **78** of a stock **76** is attached to the rear **20** of the receiver.

FIG. **2** illustrates a shell lifter adapter **100**, bolt assembly **200**, barrel **500**, and shoe **600** of the present invention. More particularly, the shell lifter adapter, bolt assembly, barrel, and shoe convert the repeating shotgun **10** into a repeating rifle capable of firing a rifle cartridge **80** instead of a 12 gauge shotgun shell. The cartridge has a front **84**, a rear **86**, and an exterior **88**. The shell lifter adapter **100**, bolt assembly **200**, and barrel **500** of the present invention can be adapted to chamber the shotgun to fire any suitable cartridge, including .50 BMG, .300 Win Mag, .308 Winchester, 7.62×39 mm, 5.56×45 mm NATO, and .22 LR, and preferably short action and lever action cartridges. The barrel, bolt assembly, and shoe of the current invention replace the barrel **30**, bolt assembly **80**, and shoe **58** of the shotgun **10**, and the shell lifter adapter attaches to the shell lifter **50**, without requiring any modification of the receiver **12**.

The rear **502** of the barrel **500** has threads **504** so that a barrel extension **506** can be threadably connected to the barrel. The barrel extension of the current invention has the same exterior dimensions as the barrel **30** of the shotgun **10** where the barrel extension is inserted into the front **18** of the receiver. The centerline of the barrel ring and the centerline of the barrel bore of the current invention will have the same dimension as the shotgun, but both the barrel and barrel ring of the current invention can have different external dimensions from the barrel **30** and barrel ring **34** of the shotgun. The interior

surface **510** of the barrel extension defines barrel extension slots **508** that are sized to receive bolt lugs **208** on the exterior **210** of the bolt **206**. The front **210** of the bolt protrudes from the front **204** of the bolt carrier **202**. The bolt assembly **200** will be described in further detail in the discussion of FIGS. **6-9**.

FIGS. **3-5** illustrate the shell lifter adapter **100** of the present invention. More particularly, the shell lifter adapter is shown removably attached to the shell lifter **50** of the shotgun **10**. The shell lifter **50** has a top **90**, bottom **92**, front **94**, and rear **96**. The front of the shell lifter has a U-shaped cutout **98**. A right tang **82** and a left tang **84** extend rearwardly. The right and has an aperture **86**, and the left tang has an aperture **88**. The apertures receive the forwardmost takedown pin **44** to pivotally attach the shell lifter to the trigger assembly **46**.

The shell lifter adapter **100** has a top **104** and a bottom **106**. The top of the shell lifter adapter defines a groove **108** that terminates in rear flanges **110** that are separated by a gap **112**. The gap permits the bolt lug to pass by, yet limits the rearward movement of the cartridge. The groove provides a cradle for the exterior **88** of the cartridge **80**. The rear flanges are positioned and shaped to permit the front **210** of the bolt **206** to pass over the top of the shell lifter adapter while still engaging the rear **86** of the cartridge to push the front **84** of the cartridge into the rear **502** of the barrel **500**. The top of the shell lifter adapter is shaped to lift the front or bullet end of the cartridge up so that when the bolt slides forward, the bullet end of the cartridge will feed smoothly into the chamber in the rear of the barrel.

As is shown in FIGS. **4** and **5**, the shell lifter adapter **100** utilizes the existing U-shaped cutout **98** in the front **94** of the shell lifter **50** to removably attach to the shell lifter. The bottom **106** of the shell lifter adapter has a U-shaped snap/spring **120** that is adapted to closely fit the cutout in the shell lifter. An optional bottom shell lifter adapter **102** has a top **114**, a bottom **116**, and a U-shaped cutout **118**. The cutout in the bottom shell lifter adapter snaps over the portion of the snap/spring that protrudes from the cutout in the shell lifter. The front of the shell lifter is essentially clamped between the bottom **106** of the shell lifter adapter and the top of the bottom shell lifter adapter.

FIGS. **6** & **7** illustrate the bolt **206** and shoe **600** of the present invention. More particularly, the bolt carrier **202** is not shown for clarity, and the bolt and shoe are shown in a first position where the rounded head **214** of a locking pin **212** has initially contacted the interior surface **510** of the barrel extension **506** as the forend **68** is moved forwardly. The bolt has a rear bore **220** and a forward bore **222**. The rear bore receives a cam pin **218** that has one end that protrudes downward from the rear bore and rides in a helical groove **604** in the top **602** of the shoe **600**. The cam pin can also ride in a similar groove in the bolt carrier.

The forward bore **222** receives a cam pin **214** that has one end with a semicircular groove **216** that protrudes downward from the forward bore. The semicircular groove engages a cylindrical locking pin **212** that is received laterally within a bore (not shown) in the bolt carrier. The locking pin has a milled recess or slot **224** (shown in FIG. **8**) that is located towards the middle of the locking pin. The slot is sufficiently wide enough to permit passage of the end of the cam pin **214** with the semicircular groove. In the first position, the engagement of the locking pin with the cam pin holds the bolt **206** forward within the bolt carrier. The engagement of the locking pin with the cam pin also keeps the bolt lugs **208** axially registered with the barrel extension slots **508** in the barrel extension **506** so the bolt lugs can pass through the barrel extension slots.

FIGS. **8** & **9** illustrate the bolt **206** and shoe **600** of the present invention. More particularly, the bolt carrier **202** is not shown for clarity, and the bolt and shoe are shown in a second position that is forward of the first position described previously with the forend **68** in its forwardmost position. In the second position, the rounded head **214** of the locking pin **212** has been shifted laterally by contact with the interior surface **510** of the barrel extension **506**. The slot **224** in the locking pin has shifted laterally so that the slot is axially registered with the end of the cam pin **214** with the semicircular groove **216**. Disengagement of the semicircular groove from the locking pin has permitted the shoe **600** and locking pin to move forward relative to the cam pin **214** once the round is chambered and the bolt lugs **208** have passed through the barrel extension slots **508**. The continued forward movement of the shoe has caused the cam pin **218** to ride rearwardly in the helical groove **604**. As the cam pin rides rearwardly in the helical groove, the cam pin has been forced to rotate, which in turn has forced the bolt to rotate into battery. The rotation of the bolt has altered the relationship between the bolt lugs and the barrel extension slots so that the bolt lugs are no longer axially registered with the barrel extension slots. The bolt cannot move rearwardly until the forend is pulled rearwardly to rotate the bolt and realign the bolt lugs with the barrel extension slots.

FIG. **10** illustrates the magazine tube adapter **300** of the present invention. More particularly, the magazine tube adapter enables the magazine tube **26** of the shotgun **10** to accept cartridges **82** that are smaller than a shotgun shell. The magazine tube adapter has an outer diameter that is sized to be closely received within the magazine tube and a central bore **310**. At one end, the magazine tube adapter **300** defines a shoulder **312** that decreases the outer diameter of the magazine tube adapter. The decrease in the outer diameter of the magazine tube adapter at one end permits the installation of a collar **314** with a central bore **318** without enlarging the outer diameter of the magazine tube adapter at that end. The magazine tube adapter has slots (slot **306** is shown) at the top **302** and bottom **304**. The collar has slots **316** and **308** at the top **324** and bottom **326**. The slots in the magazine tube adapter and the collar are contiguous and enable the magazine tube adapter to be inserted into the magazine tube and clear the detents therein. The magazine tube adapter has a left slot **328** and a right slot **330** that are aligned with a left interrupter **320** and a right interrupter **322** formed in the collar. In the current embodiment, the left and right interrupters are generally shaped like a lowercase H, and the right interrupter has an inward protrusion **336**. The function of the left and right interrupters will be described subsequently in the description of FIGS. **11-16**. In the current embodiment, the magazine tube adapter is made of plastic and the collar is made of spring steel.

FIGS. **11-16** illustrate the magazine tube adapter **300** of the present invention. More particularly, the interaction of the left and right interrupters **320**, **322** formed in the collar **314** of the magazine tube adapter with the left magazine tube interrupter **332** and right magazine tube interrupter **334** in the receiver **12** of the shotgun **10** is shown. In FIG. **11**, the forend **68** is in the forwardmost position. The rearmost cartridge **82** is retained within the central bore **310** of the magazine tube adapter by the left interrupter **320**. The left interrupter **320** is pulled inwardly by the left magazine tube interrupter **332**.

In FIGS. **12** & **13**, the forend **68** is half retracted. The rearmost cartridge **82** continues to be held in place by the left interrupter **320**. However, the right magazine tube interrupter **334** has begun to pull the right interrupter **322** inwardly. The

rear **338** of the next cartridge **340** is shown abutting the front **84** of the rearmost cartridge **82**.

In FIG. **14**, the forend **68** is fully retracted into the rearmost position. The left magazine tube interrupter **332** has pulled the left interrupter **320** outwardly, thereby disengaging the left interrupter from the rear **86** of the rearmost cartridge **82**. Disengagement of the left interrupter from the rear of the rearmost cartridge has permitted the magazine tube spring with follower **36** to begin to urge the rearmost cartridge rearward onto the shell lifter adapter **100** on the shell lifter **50**. The right magazine tube interrupter **334** has further pulled the right interrupter **322** inwardly so that the inward protrusion **336** on the right interrupter can engage with the rear **338** of the next cartridge **340** to retain the next cartridge within the magazine tube adapter **300**.

In FIG. **15**, the forend **68** is still fully retracted into the rearmost position. The left magazine tube interrupter **332** has pulled the left interrupter **320** outwardly, thereby disengaging the left interrupter from the rear **86** of the rearmost cartridge **82**. Disengagement of the left interrupter from the rear of the rearmost cartridge has permitted the magazine tube spring with follower **36** to push the rearmost cartridge rearward fully out of the magazine tube adapter **300** and onto the shell lifter adapter **100** on the shell lifter **50**. The magazine tube spring with follower has also pushed the rear **338** of the next cartridge **340** into engagement with the inward protrusion **336** on the right interrupter **322**.

In FIG. **16**, the forend **68** has returned to the forwardmost position depicted in FIG. **11**. The right magazine tube interrupter **334** has pulled the right interrupter **322** outwardly to disengage the inward protrusion **336** on the right interrupter from the rear **338** of the next cartridge **340**. Simultaneously, the left magazine tube interrupter **332** has pulled the left interrupter **320** inwardly so the next cartridge **340** is retained within the central bore **310** of the magazine tube adapter by the left interrupter. As the interrupters move, the magazine tube spring with follower **36** urges the next cartridge rearwardly once the right interrupter has disengaged from the rear of the next cartridge. The cycle can then repeat.

FIG. **17** illustrates an alternative embodiment of the magazine tube adapter **700** of the present invention. More particularly, the magazine tube adapter enables the magazine tube **26** of the shotgun **10** to accept cartridges **82** that are smaller than a shotgun shell. The magazine tube adapter has an outer diameter that is sized to be closely received within the magazine tube and an asymmetrical bore **710** that is preferably shifted to the left of center so the left magazine tube interrupter **332** can directly engage the rearmost cartridge. However, the asymmetrical bore can also be shifted to the right of center so the right magazine tube interrupter **334** can directly engage the rearmost cartridge. At one end, the magazine tube adapter **700** defines a shoulder **712** that decreases the outer diameter of the magazine tube adapter. The decrease in the outer diameter of the magazine tube adapter at one end permits the installation of a collar **714** with a central bore **718** without enlarging the outer diameter of the magazine tube adapter at that end. The magazine tube adapter has slots (slot **706** is shown) at the bottom **702** and top **704**. The collar has slots **716** and **708** at the bottom **724** and top **726**. The slots in the magazine tube adapter and the collar are contiguous and enable the magazine tube adapter to be inserted into the magazine tube and clear the detents therein. The magazine tube adapter has a right slot **728** (shown in FIG. **18**) and a left slot **730** that are aligned with a right interrupter **720** and a left slot **722** formed in the collar. In the current embodiment, the right interrupter is generally shaped like a lowercase H and has an inward protrusion **736**. The function of the right interrupter and the left slot **722** will be described subsequently in the description of FIGS. **18-21**. In the current embodiment, the magazine tube adapter is made of plastic and the collar is made of spring steel.

FIGS. **18-21** illustrate the alternative embodiment of the magazine tube adapter **700** of the present invention. More particularly, the interaction of the right interrupter **720** formed in the collar **714** of the magazine tube adapter with the right magazine tube interrupter **334** and left magazine tube interrupter **332** in the receiver **12** of the shotgun **10** is shown. In FIG. **18**, the forend **68** is in the forwardmost position. The rearmost cartridge **82** is retained within the asymmetrical bore **710** of the magazine tube adapter by the right interrupter **720**. The right interrupter is pulled inwardly by the right magazine tube interrupter **334**.

In FIG. **19**, the forend **68** is fully retracted into the rearmost position. The right magazine tube interrupter **334** has pulled the right interrupter **720** outwardly, thereby disengaging the right interrupter from the rear **86** of the rearmost cartridge **82**. Disengagement of the right interrupter from the rear of the rearmost cartridge has permitted the magazine tube spring with follower **36** to begin to urge the rearmost cartridge rearward onto the shell lifter adapter **100** on the shell lifter **50**. The left magazine tube interrupter **332** has moved inwardly through the left slot **722** so that the left magazine tube interrupter can engage with the rear **338** of the next cartridge **340** to retain the next cartridge within the magazine tube adapter **300**. The rear **338** of the next cartridge **340** is shown abutting the front **84** of the rearmost cartridge **82**.

In FIG. **20**, the forend **68** is still fully retracted into the rearmost position. The right magazine tube interrupter **334** has pulled the right interrupter **720** outwardly, thereby disengaging the right interrupter from the rear **86** of the rearmost cartridge **82**. Disengagement of the right interrupter from the rear of the rearmost cartridge has permitted the magazine tube spring with follower **36** to push the rearmost cartridge rearward fully out of the magazine tube adapter **700** and onto the shell lifter adapter **100** on the shell lifter **50**. The magazine tube spring with follower has also pushed the rear **338** of the next cartridge **340** into engagement with the left magazine tube interrupter **332**.

In FIG. **21**, the forend **68** has returned to the forwardmost position depicted in FIG. **18**. The left magazine tube interrupter **332** has moved outwardly to disengage from the rear **338** of the next cartridge **340**. Simultaneously, the right magazine tube interrupter **334** has pulled the right interrupter **720** inwardly so the next cartridge **340** is retained within the asymmetrical bore **310** of the magazine tube adapter by the inward protrusion **736** on the right interrupter. As the interrupters move, the magazine tube spring with follower **36** urges the next cartridge rearwardly once the left interrupter has disengaged from the rear of the next cartridge. The cycle can then repeat.

FIGS. **22-25** illustrate the magazine adapter **400** of the present invention. More particularly, the magazine adapter enables the shotgun **10** to feed ammunition from a detachable box magazine **428** (shown in FIG. **24**) instead of the magazine tube **26**. The magazine adapter has a front **402**, rear **404**, and bottom **406**. The front has a sleeve **430** that defines a magazine well **412**. A cylindrical boss **410** extends forward of the sleeve at a level above at least a portion of the sleeve. The boss defines a horizontal axis **438** that is perpendicular to a vertical axis **440** defined by the sleeve. The boss extends forward of a left tang **414** and a right tang **416** that extend rearwardly from opposed side panels **436** that extend above the sleeve. The left

tang has apertures **418**, **420**, and the right tang has apertures **422**, **424**. One side of the magazine adapter defines a magazine latch slot **408**. The magazine latch slot receives a magazine latch **426** that releasably secures the magazine within the magazine well. The magazine passes between the action bars (action bar **442** is shown in FIG. **25**) of the forend **68** when the magazine is received by the magazine well. In the current embodiment, the boss is made of plastic or aluminum, and the magazine well is rectangular.

The two opposed side panels **436** of the magazine adapter **400** that extend above the sleeve **430** are spaced apart to closely receive the bottom **16** portion of the receiver **12**. An upper surface portion **428** of the opposed side panels contacts the bottom of the receiver to enclose the loading port **40** with the magazine well **412** axially registered with the loading port. First, the shell lifter **50** is removed from the receiver or trigger group assembly. Subsequently, the boss **410** is inserted into the rear aperture of the magazine tube **26** to releasably retain the front of the magazine adapter via contact of a lower cylindrical surface portion with a lower portion of the magazine tube adjacent to the rear aperture. The cylindrical boss has a diameter sized to be closely received in the magazine tube. The left and right tangs **414**, **416** are then positioned on the right and left sides **22**, **24** of the receiver so that the apertures **418**, **420**, **422**, **424** are axially registered with the takedown pin apertures **42**. The takedown pins **44** are replaced with longer cylindrical pins or threaded bolts (not shown) to removably secure the rear **404** of magazine adapter to the receiver.

In the configuration depicted in FIG. **22-25**, the magazine adapter **400** enables 12 gauge shotgun shells to be fed from a detachable box magazine **428** into the shotgun **10**. However, it should also be appreciated that when the appropriate bolt assembly **200** and barrel **500** of the current invention are also installed, any suitable rifle cartridge can be fed from a suitable detachable box magazine into the shotgun **10**.

While current embodiments of a shotgun ammunition conversion system have been described in detail, it should be apparent that modifications and variations thereto are possible, all of which fall within the true spirit and scope of the invention. With respect to the above description then, it is to be realized that the optimum dimensional relationships for the parts of the invention, to include variations in size, materials, shape, form, function and manner of operation, assembly and use, are deemed readily apparent and obvious to one skilled in the art, and all equivalent relationships to those illustrated in the drawings and described in the specification are intended to be encompassed by the present invention. For example, the shotgun ammunition conversion system of the current invention works with any repeating action shotgun such as semi-automatic, automatic, and lever action, in addition to the pump action shotgun described. Furthermore, the cylindrical boss could be any suitable shape that fits the magazine tube, including hexagonal, octagonal, and semi-cylindrical. The critical surface is the bottom of the boss. Any shape that provides at least two points of contact in the lower half of the boss, to provide against the front end being lowered from its position or shifted laterally, is suitable.

Therefore, the foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

I claim:

1. A detachable magazine well for a shotgun having a frame defining a lower loading port, and a magazine tube having a rear aperture proximate the loading port, the magazine well comprising:

a sleeve defining a rectangular passage adapted to removably receive an ammunition magazine;

a boss extending forward of the sleeve and at a level above at least a portion of the sleeve;

the boss being adapted to be received in the rear aperture of the magazine tube;

the boss being adapted for securing a forward end of the magazine well to the shotgun frame; and

a first panel extending from the sleeve and defining a panel aperture operable to receive a fastener associated with the shotgun frame to secure the magazine well to the shotgun with the sleeve proximate and aligned with the loading port when the boss is received in the rear aperture of the magazine tube.

2. The magazine well of claim **1** wherein the boss has a lower cylindrical surface portion operable to contact a lower portion of the magazine tube adjacent to the rear aperture.

3. The magazine well of claim **1** wherein the boss is a cylindrical body.

4. The magazine well of claim **3** wherein the cylindrical body has a diameter sized to be closely received in the magazine tube.

5. The magazine well of claim **3** wherein the cylindrical body defines a horizontal axis perpendicular to an axis defined by the sleeve.

6. The magazine well of claim **1** wherein the sleeve includes an upper surface portion operable to contact a lower portion of the frame to enclose the loading port.

7. The magazine well of claim **1** including opposed side panels extending above the sleeve and spaced apart to closely receive a portion of the frame.

8. The magazine well of claim **7** including a tang extending rearwardly from at least one of the side panels.

9. The magazine well of claim **1** including opposed tangs extending rearwardly from the sleeve and spaced apart to closely receive a portion of the frame.

10. The magazine well of claim **9** wherein the tangs each define a tang aperture located to register with a frame aperture on the frame, and including a fastener received in the tang apertures and frame aperture.

11. The magazine well of claim **10** wherein the fastener is a cylindrical pin.

12. The magazine well of claim **1** wherein the magazine well has a major side surface defining a major plane, and wherein the panel is parallel to the major plane.

13. The magazine well of claim **1** wherein the panel occupies a vertical plane.

14. The magazine well of claim **1** wherein the boss is unitary with the sleeve.

15. The magazine well of claim **1** wherein the shotgun frame defines a transverse aperture receiving a horizontal pin, and wherein the panel aperture is registered with the transverse aperture.

16. The magazine well of claim **1** wherein the sleeve defines a major sleeve axis providing a vertical extraction direction, and wherein the panel aperture defines a panel aperture axis perpendicular to the sleeve axis.

17. The magazine well of claim **1** wherein the panel aperture spaced apart rearward of the boss.

18. A method of attaching the magazine well of claim **1** to the shotgun comprising:

positioning the boss in the rear aperture of the magazine tube;

registering the sleeve with the loading port;

aligning the tang aperture with a frame aperture defined by the frame; and

inserting a fastener into the tang aperture and the frame aperture.

19. A detachable magazine well for a shotgun having a frame defining a lower loading port providing communication with an internal space, opposed parallel sidewalls defining transverse apertures, and a magazine tube having a rear aperture proximate the loading port, the magazine well comprising:

a sleeve defining a rectangular passage adapted to removably receive an ammunition magazine;

a boss extending forward of the sleeve and at a level above at least a portion of the sleeve;

the boss being adapted to be received within the internal space of the frame in the rear aperture of the magazine tube;

the boss being adapted for securing a forward end of the magazine well to the shotgun frame;

the sleeve being adapted to be secured externally of the internal space;

an intermediate connection portion connecting the boss to the sleeve and passing through the loading port;

opposed first and second panels extending from the sleeve and spaced apart to abut respective sidewalls of the frame to closely receive the frame therebetween; and

at least one of the first and second panels defining a panel aperture registered with the transverse aperture and operable to receive a fastener occupying the transverse aperture.

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